THE SPIDER GENERA *GEA* AND *ARGIOPE* IN AMERICA (ARANEAE: ARANEIDAE)

HERBERT W. LEVI

This is the first publication in a series of revisions of North American orb weavers. Despite having studied representatives of the genera of the family Araneidae, I am not yet certain of the limits and diagnoses of the numerous araneid genera. The genus *Argiope* is an exception; the species belonging to it are readily placed. As the work progresses, I expect that the relative importance of the various characters will become increasingly apparent, and there will be less need to illustrate as lavishly as in this paper. As most North American species of *Argiope* have wide distributions into South America, I have found it advisable to include South American members of the genus. Even though *Argiope* includes our commonest spiders, the collections examined had many specimens erroneously determined, and the Central American and Mexican species have been confused. In this genus, as in other Araneidae, it is not at all easy to match males and females. The broken-off embolus tip of the male palp, found in the connecting ducts of the female, is often very useful in matching the sexes and identifying females of some difficult species (e.g. *Argiope argentata*, Figs. 130–133).

During the last 10 years the economic importance of spiders, particularly the orb weavers, has become recognized. Not only are they used as test animals for laboratory experimentation, but the value of spiders in natural control of insect pests is being studied. The difficulty in determining even common spiders is immense and has been a bottleneck in many researches. The few specialists with knowledge of spiders are overwhelmed with requests for determinations. Next to the Linyphiidae, the Araneidae are most difficult to determine at the present time, but fragmentation of the family into many meaningless genera, as in the Linyphiidae, luckily is less of a problem in the study of the Araneidae.

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A. Willink and Mr. Z. Tomsic of the Instituto Miguel Lillo, Tucumán. Father Chrysanthus sent a gift of New Guinea species of *Argiope*; Dr. B. Y. Main sent specimens from western Australia; Dr. O. Kraus, Senckenbergische Naturforschende Gesellschaft supplied information; Dr. G. Owen Evans and Mr. D. L. Clarke of the British Museum (Natural History) checked types; Dr. C. Dondale checked specimens in the Canadian National collections; Mr. R. König supplied a photograph of *Argiope lobata*; and Mr. Robin Leech sent data on distributions in Canada.

The labels of the Wallace and Weems collections provided valuable ecological information from Michigan and Florida.

In this and all anticipated revisions, as in most of my theridiid revisions, I omit unillustrated literature records that lack voucher specimens in one of the large public spider collections. The reason for this is that I have found even the commonest species to be frequently misidentified in the literature.

ARANEIDAE Latreille, 1806

Araneides Latreille, 1806, Genera Crustaceorum et Insectorum, 1: 82. Family Araneides including the genus *Aranea* Linn. (= *Araneus* Clerck 1757), which is the type genus.

Araneidea Leach, 1817, Zoological Miscellany, 3: 47. Family Araneidea for species included in this family by Latreille.

Araneadae Leach, 1819, *in* Samouelle, Entomologists Useful Compendium. Family Araneadae including the genus *Aranea*, which is the type genus.

Epeirides Sundevall, 1833, Conspectus Arachnidum, p. 13. Type genus *Epeira* (= *Araneus*, objective synonym), subsequently used as Epeiridae.

Argiopidae Simon, 1890, Ann. Soc. Entomol. France, (6)10: 81. Type genus *Argiope*.

Araneidae Dahl, 1912, Handwörterbuch der Naturwissenschaften, 1: 502.

Note: Of the three family names, Epeiridae has been used most, Araneidae least. At the present time, Araneidae is used by German and some American authors, Argiopidae by the French (including Bonnet's catalog) and by many English and American authors. Epeiridae is no longer in use.

Bonnet, in his authoritative *Bibliographia Araneorum*, reasoned that the name Araneidae is so similar to the name of the Order Araneae as to create confusion; he therefore rejected Araneidae in favor of Argiopidae. However, if we were to follow Bonnet we would have to reject some of the commonest family names of animals, including Scorpionidae and Acaridae among the arachnids. To end the confusion resulting from use of three names for one family, I have applied The International Code of Zoological Nomenclature on the availability of family group names. The earliest emendation of Araneides to the current spelling, Araneidae, appears to be that of Dahl (Kaston, 1938, Amer. Midland Natur., 19: 640). An application to the International Commission on Zoological Nomenclature has been prepared requesting placement of the Araneidae Latreille, 1806 on the Official List of Family Names in Zoology.

Description. Araneidae are web spiders. They lack a cribellum and calamistrum, have no trichobothria on femora or tarsi, and have three claws on their tarsi. The legs are relatively short, covered with macrosetae ("spines")[1], but there is no comb on the fourth metatarsus. The eyes are arranged in two rows and in three groups, the median group of four eyes forming a square or trapezoid separated by

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[1] A spine is defined in American dictionaries as a "stiff, pointed external process" (Pennak, 1964, Collegiate Dictionary of Zoology, Ronald Press).

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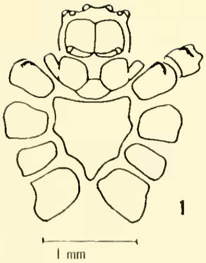
Gea heptagon (Hentz) female. Fig. 1. Ventral view of sternum and coxae. Figs. 2, 3. Left chelicera. 2. Anterior view. 3. Posterior view. Figs. 4–8. Epigynum. 4. Dorsal view. 5. Ventral view. 6. Posterior view. 7, 8. Lateral view. Fig. 9. Epigyna of eight individuals from Cameron, Louisiana. Fig. 10. Epigyna of eight individuals from Washington Co., Arkansas. Fig. 11. Dorsal view, Louisiana. Fig. 12. Ventral view of abdomen, Louisiana. Fig. 13. Ventral view of abdomen, St. Croix, West Indies. Fig. 14. Dorsal view, St. Croix, West Indies.



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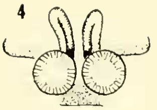

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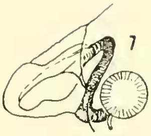
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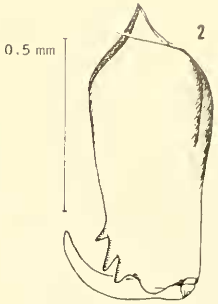

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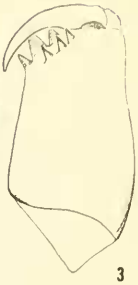
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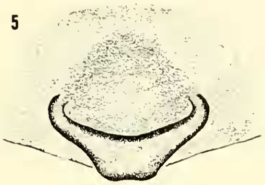
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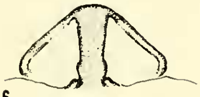
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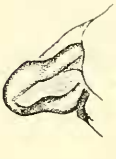
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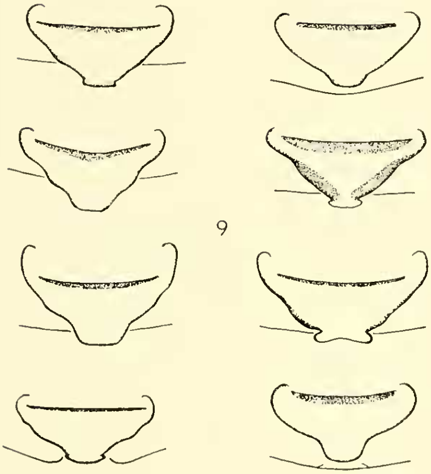
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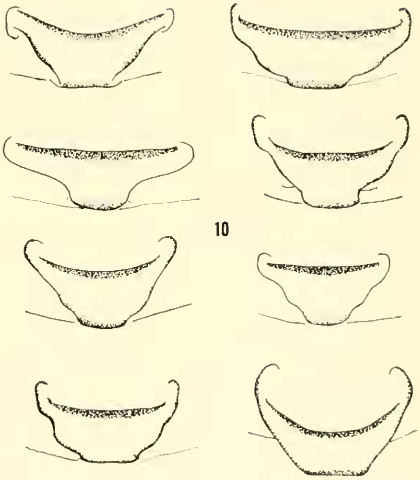
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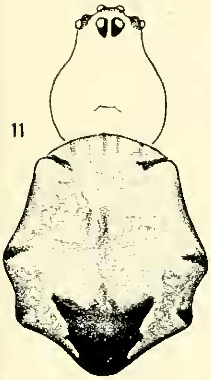
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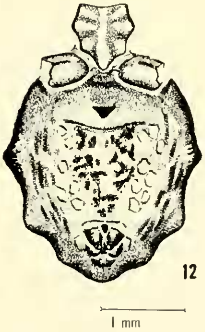

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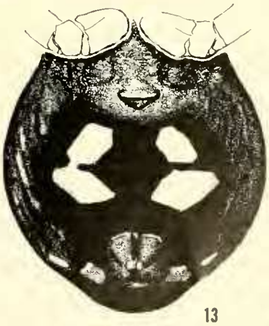
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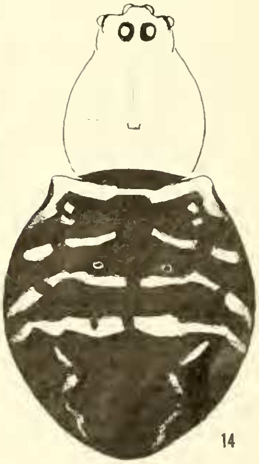
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some distance from the two lateral eyes on each side. The eyes are all alike. The area between the eyes and the border of the carapace, the so-called "clypeus" (better called front), is low, less than the height of the eye region. Anatomically, the clypeus is the area behind the chelicerae, and the name might better be abandoned in taxonomic discussions.

The chelicerae may lack the anterior dorsal projection under the front that is present in many Theridiidae and that serves for muscle attachment. This projection may be present in the Argiopinae. On the face of the chelicerae below the front may be a knob, little developed in Argiopinae. The chelicerae are strong with two rows of teeth and a short, strong fang. The labium has the anterior edge swollen or "rebordered." There are six spinnerets (Fig. 66).

The paracymbium (P in Figs. 19, 20) of the male palpus is attached to the proximal end of the cymbium; it is not a free sclerite as in the Linyphiidae.

Most of the Araneidae construct orb webs; the spider hangs in the web head down.

At present I do not know the limits of family, nor can I judge whether Tetragnathinae belong to the family. The inclusion of *Tetragnatha* has no bearing on the family name, according to the International Code of Zoological Nomenclature (1961), as the family name is attached to the genus *Araneus* no matter what else is included in the family.

Subfamily ARGIOPINAE Simon 1890

Argiopidae Simon, 1890, Ann. Soc. Entomol. France, (6)10: 81. Type genus *Argiope*.

Argiopinae Simon, 1895, Histoire Naturelle des Araignées, 1: 759.

The posterior eye row, seen from above, is strongly procurved (Figs. 14, 43, 58). The anterior lateral eyes are smaller than the other eyes (Figs. 17, 74, 102, 127). The anterior boss on the chelicerae (Figs. 2, 3, 46–48, 63–64) is relatively small, and the anterior face has a proximal pointed apodeme similar to that of theridiids (Figs. 2, 3, 46, 47).

Of the first pair of legs, the coxae and trochanters each have a ventral tubercle or ridge (Figs. 1, 92, 114–115, 139). The tarsus and metatarsus combined is longer than the patella and tibia of each leg. The labium is wider than long (Fig. 65). Males are much smaller than females.

The male palpi (Figs. 19–20, 39, 42) resemble those of theridiids. The terminal apophysis characteristic of *Araneus* is lacking, and the tip of the embolus breaks off when mating and remains in the female tubes probably in all species of *Argiope*.

The spiders hang in the center of the almost vertical orb web and do not have a retreat (Plate 1, fig. 2; Plate II).

Three genera were included in the subfamily: *Argiope*, *Gea* and *Mecynogea*. *Mecynogea* does not belong to the subfamily.

MECYNOGEA Simon 1903

Hentzia McCook, 1894, American Spiders, 3: 244. Type species by monotypy *Epeira basilica* McCook. Name preoccupied by *Hentzia* Marx, 1883, in Howard's List of Invertebrate Fauna of South Carolina, p. 26.

Mecynogea Simon, 1903, Ann. Soc. Entomol. Belgique, 47: 25. Type species by subsequent designation (Petrunkevitch, 1928, Trans. Connecticut Acad. Sci. 29: 135) *M. bigibba* Simon 1903, from Brazil, examined.

Allepeira Banks, 1932, Publ. Oklahoma Biol. Surv. 4: 23. New name to replace *Hentzia* McCook. NEW SYNONYMY.

Key to Genera of Argiopinae

1a. Anterior median eyes equally spaced or closer to laterals (Figs. 1, 17); adult females smaller than 6 mm 2

1b. Anterior median eyes usually closer to each other than laterals (Figs. 44, 59, 94); adult females larger than 9 mm .... *Argiope*

2a. Adult females .... *Gea*

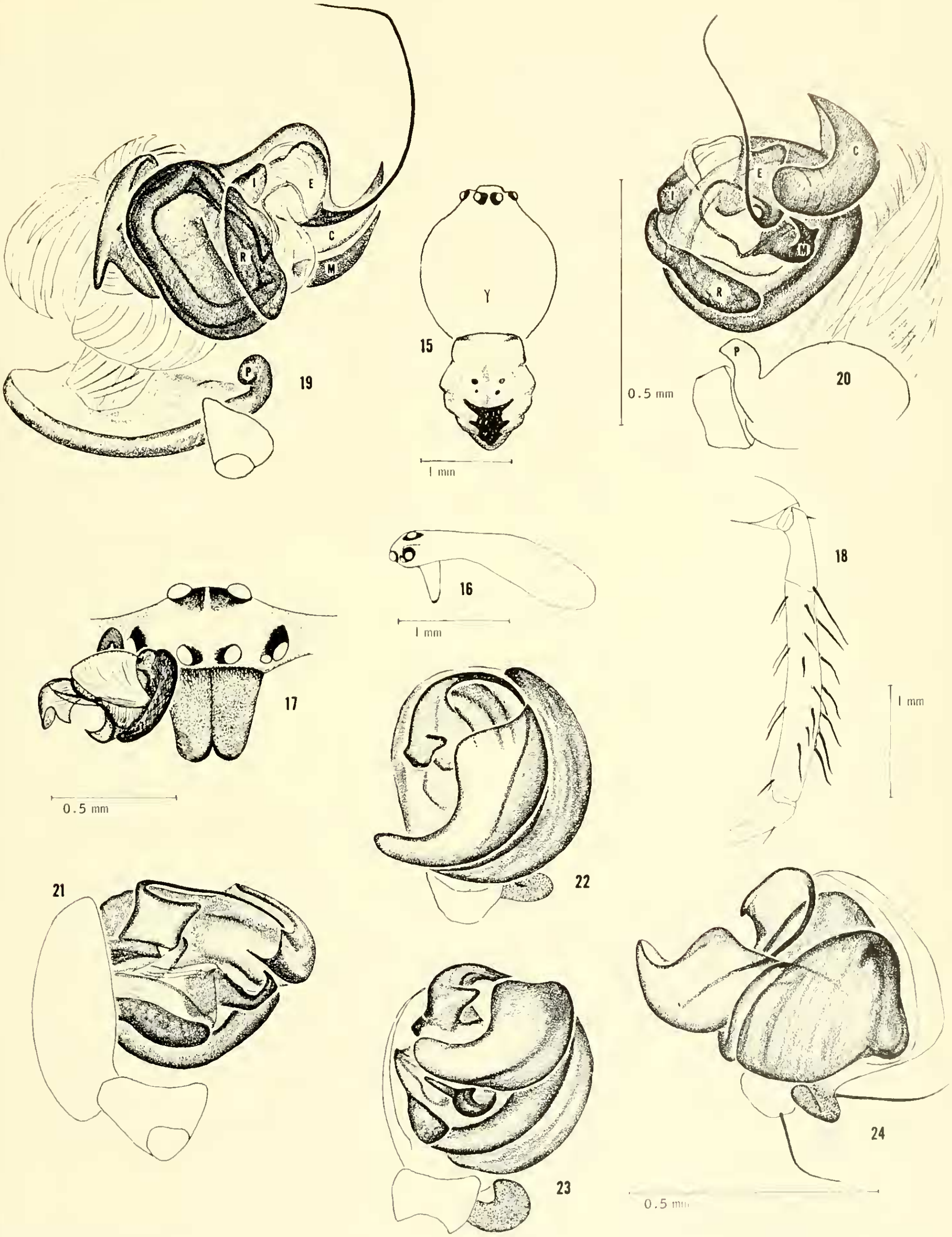
2b. Adult males 3a

3a. First tibia curved and bearing strong macrosetae (Fig. 18). .... *Gea*

3b. First tibia straight and armed as other legs are (Fig. 73) .... *Argiope*

GEA C. L. Koch 1843

Gea C. L. Koch, 1843, Die Arachniden, 10: 101. Type species by monotypy *Gea spinipes* C. L.



Gea heptagon (Hentz), male. Fig. 15. Dorsal view. Fig. 16. Lateral view of carapace and chelicerae. Fig. 17. Eyes and chelicerae. Fig. 18. First left patella and tibia, prolateral view. Figs. 19–24. Left palpus. 19–20. Expanded. 21. Mesal view. 22, 23. Ventral view. 24. Ectal view.

Abbreviations: C, conductor; E, embolus; I, stipes; M, median apophysis; P, paracymbium; R, radix.

Koch, *ibid.*, 10: 101, pl. 823, from the East Indies.

Koch could not determine the sex of the specimen he described, as the palpi were missing and the abdomen shrivelled. The specimen, belonging to the Berlin Museum, could not be located in 1966.

Despite the incomplete description, it has been assumed, since the time of Simon, that *Gea* differs from *Argiope* in having the anterior eyes evenly spaced. This is not apparent in the Koch illustration. Furthermore, young *Argiope*, and often small males, also have the anterior eyes evenly spaced. The species *Gea heptagon* has always been associated with *Gea*, and it is best to keep it in the genus until more knowledge about the characters of the different genera of Araneidae becomes available.

Another character that separates the genera is the modified first tibia, curved and armed with macrosetae in males of *Gea* (Fig. 18), unlike that of *Argiope* (Fig. 73). Koch's specimen may have been a male, as the first tibiae appear to be curved and armed in the illustration.

According to Simon (1895, Histoire Naturelle des Araignées, 1: 768), *Gea* does not make a stabilimentum.

Of the numerous species described from the Americas, some are *Gea heptagon*, others juvenile *Argiope*. Many were described by Franganillo, whose descriptions of Cuban spiders are barely recognizable, and who did not make holotypes. His collection is kept at the Institute of Zoology, Academia de Ciencias de Cuba, La Habana. The collection, though well preserved has no labels, only numbers glued to bottles. No catalog is known to exist (personal communication Dr. P. Alayo D., March, 1967.)

The *Gea* species described from America with their probable synonymy are:

Gea bimucronata Mello-Leitão, 1936, Rev. Chilena Hist. Natur., 40: 125, fig. 14. Female, probably mature, possibly *Argiope trifasciata*. The holotype is probably in the Rio Museum but could not be examined.

Gea decorata Thorell var. *varians* Franganillo, 1926, Bol. Soc. Entomol. España, 9: 12, Cuba. The coloration suggests a juvenile *Argiope argentata*.

Gea integra Franganillo, 1930, Invest. Inst. Nac. Cienc. Havana, 1: 19, Cuba. The sketch of the narrow abdomen with a tubercle on each side suggests a juvenile *Gea heptagon*. Scattered pigment was probably mistaken for the epigynum.

Gea lineata Franganillo, 1926, Bol. Soc. Entomol. España, 9: 53, Cuba. Coloration and lack of tubercles suggest a juvenile *Argiope trifasciata*.

Gea panamensis Chamberlin, 1916, Bull. Mus. Comp. Zool., 40: 243, pl. 19, fig. 8, ♂. Male holotype from Panama, in the Museum of Comparative Zoology, examined, is *Argiope argentata*.

Gea partita Franganillo, 1930, Invest. Inst. Nac. Ciencia, 1: 17, Cuba. This may be a juvenile *Gea heptagon*, and the description of the epigynum that of scattered pigment spots.

Gea praedicta O. P.-Cambridge, 1898, Biologia Centrali-Americana, Araneidea, 1: 267, pl. 37, fig. 11 ♂. Male holotype from Teapa, Tabasco, Mexico, in the British Museum, is *Gea heptagon*.

Gea severinoi Mello-Leitão, 1917, Broteria, 15: 91. Female from Bello Horizonto, Minas Gerais. This species makes a stabilimentum and the description indicates that it is a juvenile *Argiope argentata*. The holotype was not available for examination.

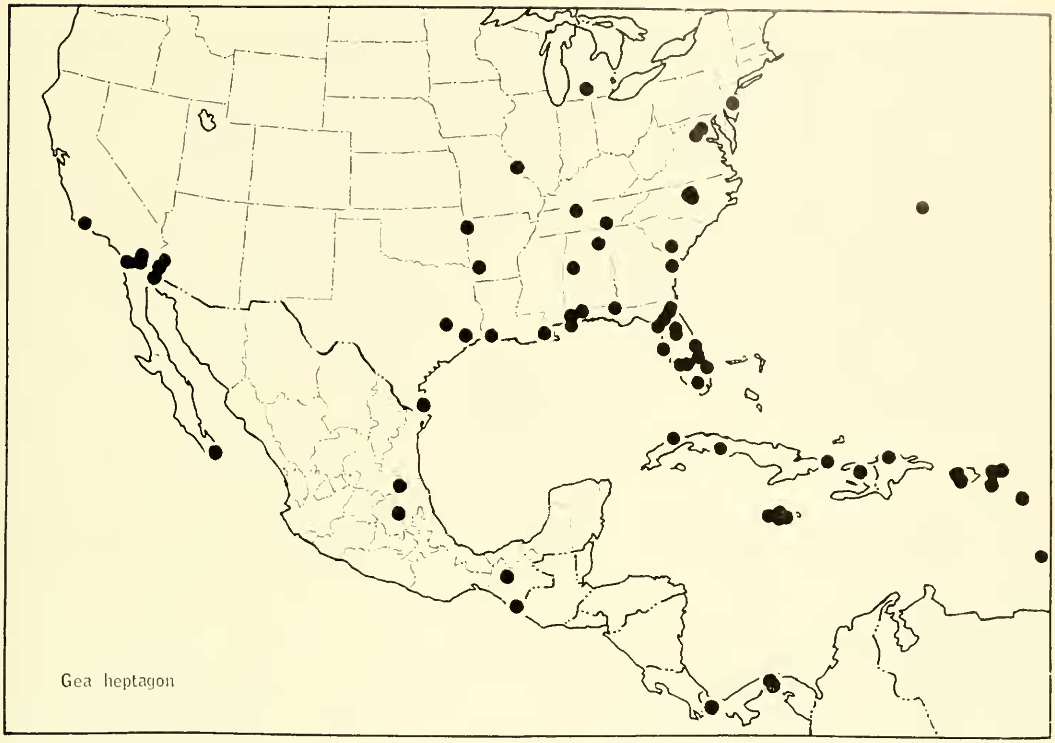
Gea subarmata Thorell var. *maculata* Franganillo, 1930, Invest. Inst. Nac. Ciencia, 1: 19, Cuba. The description appears to be that of a *Gea heptagon*.

Gea heptagon (Hentz)

Figures 1–24; Map 1

Epeira heptagon Hentz, 1850, J. Boston Soc. Natur. Hist., 6: 20. Type localities, North Carolina and Alabama; specimens lost.

Gea heptagon,—Keyserling, 1892, Die Spinnen Amerikas, 4: 76, pl. 3, fig. 58, ♀. McCook,



Map 1. Distribution of *Gea heptagon* (Hentz).

1893, American Spiders, 3: 208, pl. 12, fig. 8, ♀. Tullgren, 1901, Bihang Svensk. Vet. Akad., 27: 9, fig. 5, ♂. Petrunkevitch, 1930, Trans. Connecticut Acad. Sci., 30: 243, figs. 93–96, ♀♂. Roewer, 1942, Katalog der Araneae, 1: 746. Bonnet, 1957, Bibliographia Araneorum, 2: 1982.

Gea praedicta O. P.-Cambridge, 1898, Biologia Centrali-Americana, Araneidea, 1: 267, pl. 37, fig. 11, ♂. Male holotype from Teapa, Tabasco, Mexico, in the British Museum (Natural History), examined by D. Clark and compared to my figures. NEW SYNONYMY.

Gea heptagon var. *nigra* Petrunkevitch, 1930, Trans. Connecticut Acad. Sci. 30: 245, figs. 97–100. Female holotype from Puerto Rico, lost. NEW SYNONYMY.

? *Gea integra* Franganillo, 1930, Invest. Inst. Nac. Cienc. Havana, 1: 19, Cuba. NEW SYNONYMY.

? *Gea partita* Franganillo, 1930, *ibid.* 1: 17, Cuba. NEW SYNONYMY.

? *Gea subarmata* Thorell var. *maculata* Franganillo, 1930, *ibid.*, 1: 19, Cuba. NEW SYNONYMY.

Gea ergaster,—Chamberlin and Ivie, 1944, Bull. Univ. Utah, Biol. Ser., 8 (5): 104. Not *Epeira ergaster* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 55.

Note: Franganillo's names have insufficient descriptions to place them with certainty. The Chamberlin and Ivie (1944) synonymy of *Gea heptagon* with the older *Epeira ergaster* is an error. Walckenaer's name has Abbot manuscript figure 235 as holotype. Abbot's figure shows a light brown spider, probably of the genus *Araneus*, certainly not *Gea heptagon*. (Color photographs of Abbot illustrations and a microfilm are in the Museum of Comparative Zoology.) The Abbot specimens, found in a wasp nest, were presumably illustrated when dry. There is no need to change the widely accepted name of this species.

Description. Male. Carapace yellow-brown, legs yellow-brown. Abdomen shield-shaped with lobes on sides, a black patch on posterior part. Anterior median eyes largest; anterior lateral eyes smallest, one-half size of posterior laterals. Anterior median eyes one diameter apart, one diameter from laterals. Posterior median eyes two diameters apart, more than two diameters from laterals. Posterior median eyes three diameters from anterior medians. Total length 2.6 mm. Carapace 1.7 mm long, 1.5 mm wide. First femur, 2.1 mm; patella and tibia, 2.2 mm; metatarsus, 2.1 mm; tarsus, 0.9 mm. Second patella-tibia, 2.1 mm; third, 1.1 mm; fourth, 1.7 mm.

Female. Carapace yellow-brown. Sternum with longitudinal median light line and white lines going laterally to the coxae. Legs yellow-brown with dark bands. Dorsum of abdomen white with a median posterior dark triangle (Fig. 11). Venter with white pigment spots and median line of dark spots (Fig. 12). Anterior median eyes one and one-half diameters apart, one and one-half diameters from laterals. Posterior median eyes one and one-quarter diameters apart, two and one-half diameters from laterals. Total length 4.5 mm. Carapace 1.9 mm long, 1.8 mm wide. First femur, 2.3 mm; patella and tibia, 2.5 mm; metatarsus, 1.9 mm; tarsus, 0.5 mm. Second patella and tibia, 2.1 mm; third, 1.3 mm; fourth, 2.1 mm.

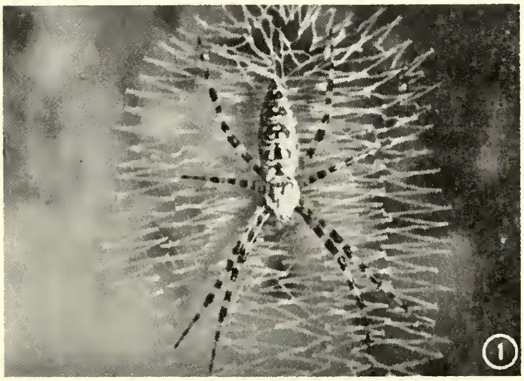


Plate I. Fig. 1. Juvenile *Argiope trifasciata* hanging in web; from Liberty Co., Florida. (Photo by H. K. Wallace.) Fig. 2. Adult *Argiope argentata* hanging in web; from Plantation Key, Florida.

Specimens from the West Indies have light, probably silver, transverse bands, more contrasting (Fig. 14) than in specimens from the southeastern United States. The specimens with most contrast came from Puerto Rico and the West Indies (Figs. 13, 14). McCook (1893) indicated and illustrated some of the light areas of the abdomen as metallic silver similar to the color of many species of *Argiope*. Petrunkevich (1930) described the light areas as pearly white.

Habits. Despite the common occurrence of *Gea heptagon*, there are no adequate descriptions of its habits or of its web. The web appears to lack a stabilimentum and the viscid spiral is dense. The web is perpendicular and on the slightest disturbance the spider will drop out of it (Hentz, 1850). The web is probably made in low herbaceous vegetation (J. Beatty, pers. comm.). In large collections obtained by A. M. Chickering in the West Indies in 1966, *Gea heptagon* was common, but was never collected with *Argiope trifasciata*. Both species were collected with *Argiope argentata*.

Distribution. Michigan, New Jersey to West Indies, west to southern California, south to Panama.

Records. Several collections are available from the vicinity of Albion, Michigan; there is a literature record from southern Wisconsin. The species is common in the West Indies as far south as St. Lucia (Map 1).

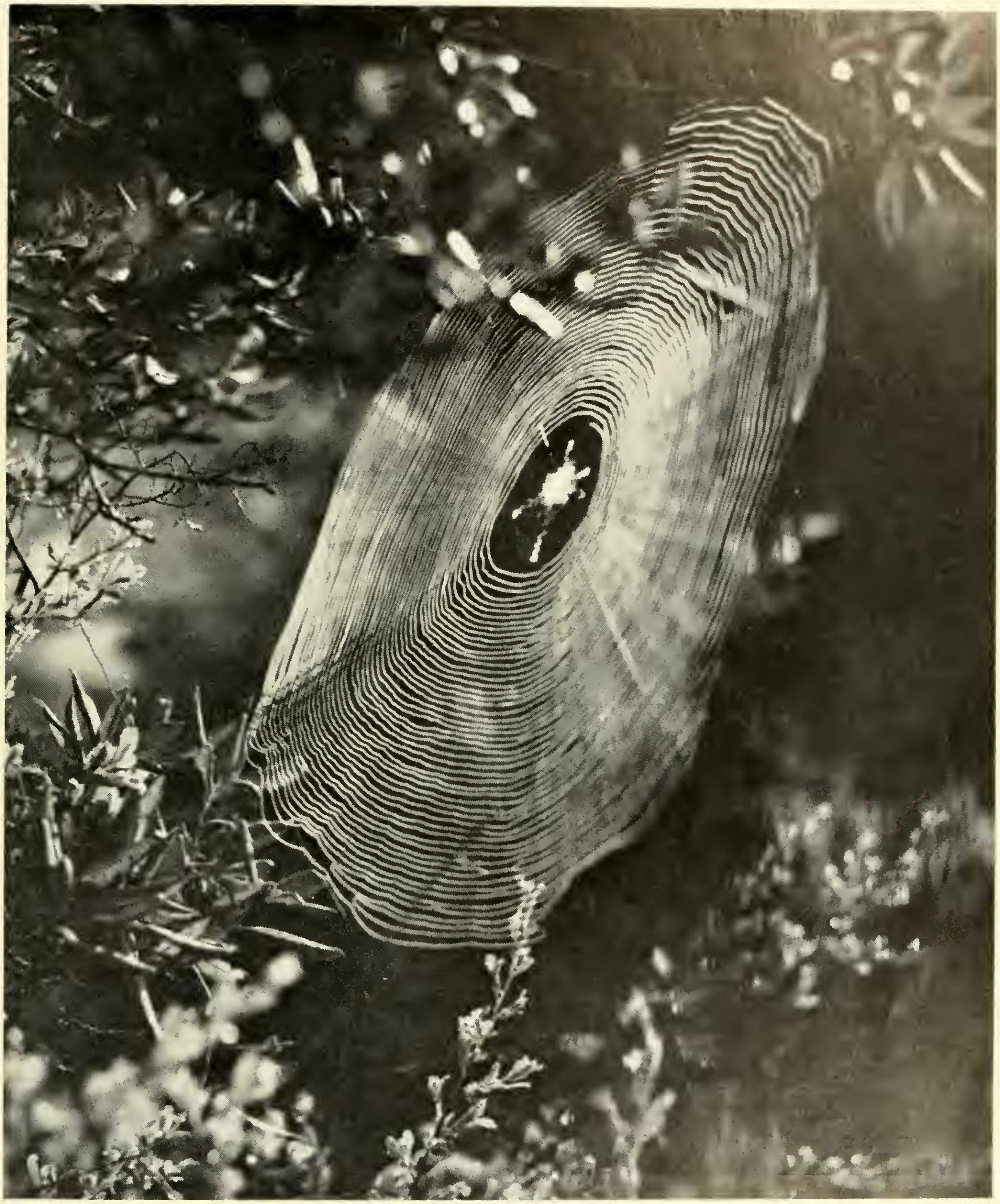


Plate 11. Web of *Argiope florida* Chamberlin and Ivie, showing the four stabilimenta. The spider hangs head down in the hub on the right side of web. (Photo by Dr. T. Eisner, courtesy of Amer. Assoc. Adv. Sci. and T. Eisner.)

ARGIOPE Audouin 1826

Argyope Audouin, 1826, Explication sommaires des planches d'Arachnides de l'Egypte et de la Syrie *in* Savigny's Descriptions de l'Egypte et de la Syrie (4): 121. Type species designated by Thorell, 1869, On European Spiders, p. 51, *Argiope lobata* (= *A. sericea* Olivier,—Audouin, 1826).

Argiope,—Audouin, 1827, *ibid.*, 2 ed., 22: 328. Thorell, 1869, On European Spiders, p. 51. Emendation of generic name used by almost all later authors. Bonnet, 1955, Bibliographia Araneorum, 2: 667.

Argyopes,—Latreille, 1829, Les Arachnides, *in* Cuvier, La Règne Animale, p. 548. (This form was used by several authors before 1875.)

Miranda C. L. Koch, 1835 in Herrich—Schaeffer, Deutschlands Insekten, Heft 128, pl. 14. Type species *Miranda transalpina* C. L. Koch [= *Argiope bruennichi* (Scopoli)]. *Miranda* was first synonymized with *Argiope* by Thorell, 1869, On European Spiders, p. 51.

Argiopes,—L. Agassiz, 1846, Nomenclator Zoologicus, Soloduri, Arachnidae, p. 2.

Metargyope F. P.-Cambridge, 1903, Biologia Centrali-Americana, Araneidea, 2: 451. Type species by monotypy *A. trifasciata*.

Notes: 1. The word *Argiope* is derived from the Greek for brilliant eye [Αργίοπη] and would today require an i in its spelling (Appendix B, Internat. Code Zool. Nomencl.). In no place is the name spelled with an i in the first edition. In the second edition, *Argiope* appears with i. Thorell, 1869 (the first of several authors to do so), considered *Argiope* to be an emendation by the original author.

2. The name of the genus has been spelled for almost 100 years with an i. It has never been spelled with y in the American literature or in the combination *Argiope aurantia*. In the combination *A. trifasciata*, the common cosmopolitan species, the genus has been spelled with y by only four authors in five publications, while 53 authors in over 100 publications spelled it with i up to 1938 (Bonnet, 1955).

3. Bristowe, in his book *Comity of Spiders* (1939, Ray Soc., London), spelled the family name with y. Judging by other changes made, Bristowe was unaware of the importance of keeping the spellings of scientific names unchanged and also of the provisions of the International Code on Zoological Nomenclature (for seeking relief from unnecessary changes brought about by strict adherence to the Code). Roewer's *Katalog der Araneae* (1952–1954), while a very useful compendium, changed numerous spellings from long accustomed usage. The authoritative *Bibliographia Araneorum* of Bonnet (1945–1961) avoided such changes by discussing in footnotes any problems concerning the correct spellings in use since the time of Thorell.

4. Unfortunately, some German authors, particularly W. Crome, have followed Roewer, apparently unaware of possible errors and of the discussion in Bonnet's catalog. Crome, in his studies on the biology of *Argiope bruennichi*, used the spelling with y. The only recent taxonomic work on *Argiope* is that of Father Chrysanthus (1958, 1961), on New Guinea spiders, who was advised to use the spelling with y.

5. There appear to be two general interpretations of the Code on Zoological Nomenclature. One favors strict adherence to the Code, relief from its strictures to be sought by application of the individual case to the International Commission of Zoological Nomenclature, and considers that the 50-year statute of limitations requires such a procedure. No issue can be taken with this view except the enormous amount of

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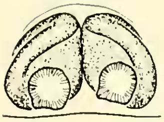
Argiope lobata (Pallas). Figs. 25–35. Epigynum. 25. Dorsal view, USSR. 26. Ventral view, USSR. 27. Posterior view, USSR. 28. Lateral view, USSR. 29. Dorsal view, Italy. 30. Ventral view, Italy. 31. Posterior view, Italy. 32. Lateral view, Italy. 33. Dorsal view, France. 34. Ventral view, France. 35. Posterior view, France. Fig. 36. Female. Fig. 37. Left palpus, mesal view (Isl. Tremiti, Italy). Fig. 38. Palpus, ectal view (Isl. Tremiti, Italy).

Argiope bruennichi (Scopoli). Figs. 39–41. Left palpus. 39. Expanded. 40. Mesal view. 41. Ectal view.

Argiope argentata (Fabricius). Fig. 42. Left palpus expanded.

Abbreviations: C, conductor; E, embolus; I, stipes; M, median apophysis; R, radix.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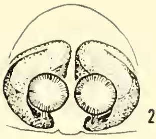
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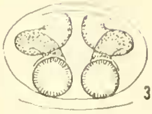
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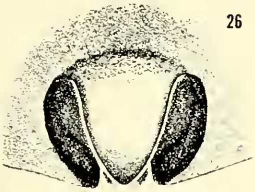
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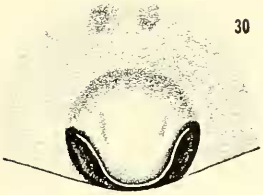
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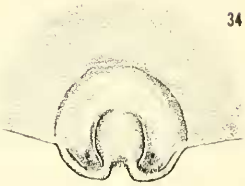
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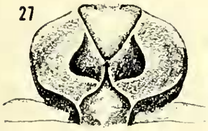
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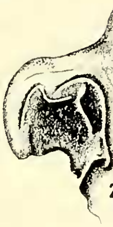
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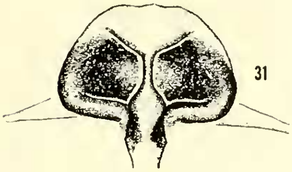
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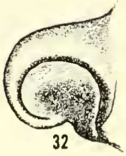
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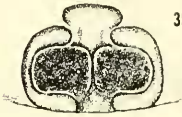
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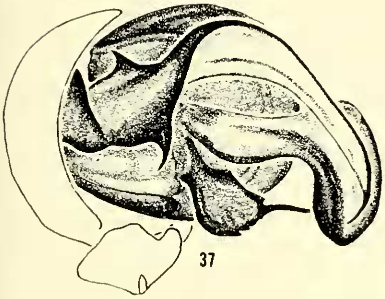
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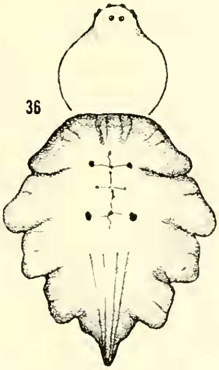
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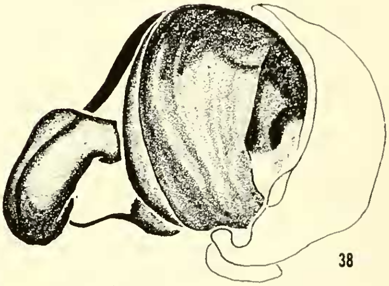
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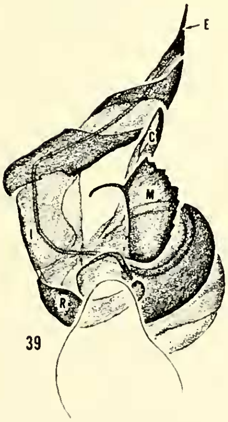

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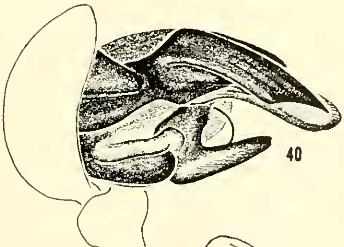
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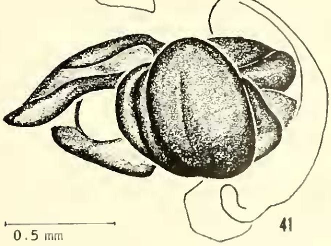
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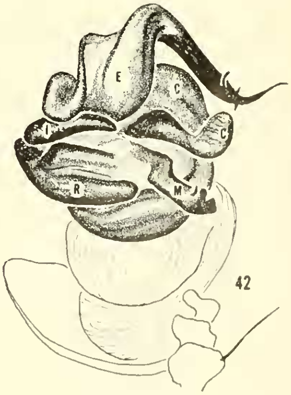

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non-constructive and time-consuming work in making the applications, and the disagreements that arise over small details in applications.

The other view is that names should be freely changed about in strict accord with the text of the Code. The proponents feel that only in this way will final stability come about. This is not a convincing argument considering that one still finds the name *Miranda* (a synonym of *Argiope*) in catalogs of biological supply houses and in popular literature, and the name Attidae in the technical literature although Attidae was supplanted by Salticidae at the turn of the century, when the name *Attus* (Walckenaer 1805) was found to be a synonym of *Salticus* Latreille 1804 (Bonnet, 1955, *Bibliographia Araneorum*, 2: 781). Also the junior objective synonyms of *Araneus*, *Aranea* and *Epeira* continue to be used.

The spellings in Roewer's Katalog have unfortunately only added to our nomenclatural burden and have added unnecessary synonyms where there has been relative stability since the time of Thorell. Each case has to be considered individually. Roewer, unlike Bonnet, did not discuss the problems of name spellings. Therefore, when in doubt, we may have to consider the possibility that mistakes were made by Roewer.

The interpretation of the Code shared by a number of North American spider specialists familiar with the Code (consulted in letters during summer 1966) is that the spelling of the generic names used in Bonnet's authoritative *Bibliographia Araneorum* should be continued and that the continuity and stability of scientific animal names is paramount.

It should also be pointed out that in regard to original spellings the recent (1961) International Code of Zoological Nomenclature has a change from the previous (French) version, which condoned later emendation. No provision, except through the Statute of Limitations, was made in the new (1961) Code to bring relief in the very many cases in the Animal Kingdom in which the emended spelling has become the accepted name.

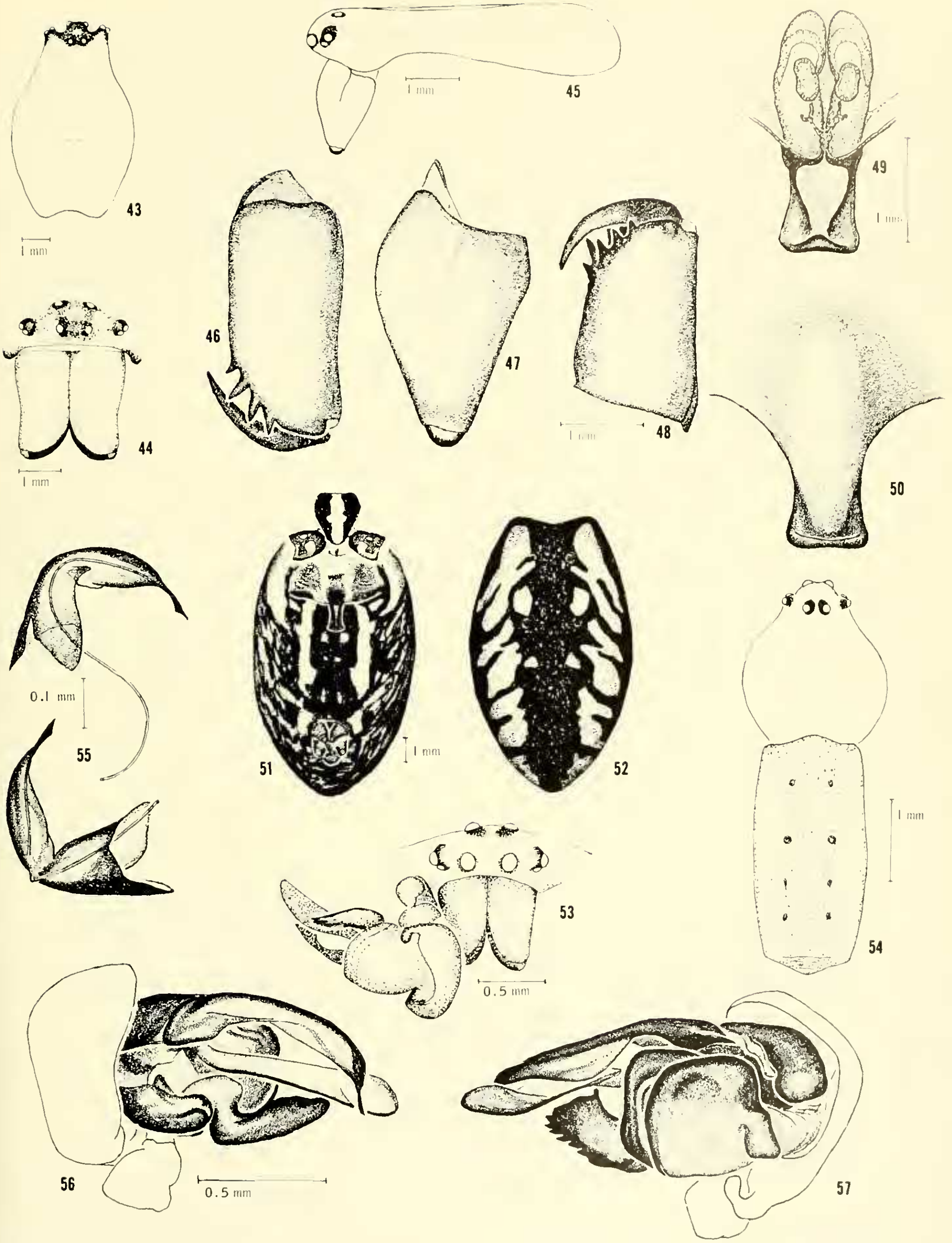
6. A formal application to the International Commission on Zoological Nomenclature to preserve the name *Argiope* has been made.

7. An added complication is the homonym *Argiope* Eudes-Deslongchamps 1842, for a brachiopod, the name of which was promptly emended to *Argyope* Davidson, 1850 (according to Neave 1939, *Nomenclator Zoologicus*, 1: 293). This name has been replaced by *Megathiris* d'Orbigny, 1847 (see Schuchert, 1929, *Fossilium Catalogus*, part 42, Brachiopoda), according to information kindly supplied by Dr. G. A. Cooper of the United States National Museum, presumably because *Argiope* Eudes-Deslongchamps was considered a junior homonym of *Argiope* Audouin. The use of the name *Argyope* in spiders may thus affect the stability of names of brachiopods.

Diagnosis. Argiope differs from other araneids (except *Gea*) in having the posterior eye row strongly procurved (Fig. 36). The anterior lateral eyes are smaller than the posterior laterals (Figs. 45, 74, 102). Each of the posterior median and lateral eyes has a boat-shaped tapetum in the lateral half, a grate-shaped tapetum in the median half. The boss on the anterior face of chelicerae is relatively small (Figs. 46–48) and the chelicerae are much weaker than in *Araneus*, and are sometimes inclined posteriorly at the distal end.

The leg metatarsus and tarsus is longer than the patella and tibia. The abdomen of females is shield-shaped (Figs. 36, 52, 61), that of males and juveniles longer than wide (Figs. 54, 76, 103, 128, 148).

All make a nearly vertical orb web having a stabilimentum or two stabilimenta crossing (in *A. argentata* and *A. florida* Plate 1; Plate II). The stabilimentum is always more elaborate in young than in adults (Plate I). Despite its name, the white bands do not function in support of the



Argiope aurantia Lucas. Figs. 43–45. Female carapace and chelicerae. 43. Dorsal. 44. Anterior 45. Lateral. Figs. 46–48. Left female chelicera. 46. Anteria-mesal. 47. Lateral. 48. Ventral. Figs. 49–50. Epigynum. 49. Dorsal view. 50. Ventral view. Figs. 51–52. Female abdomen. 51. Ventral. 52. Dorsal. Fig. 53. Male eyes, chelicerae and palpus. Fig. 54. Male, dorsal view. Fig. 55. Tips of a male embolus retrieved from female epigynum. Fig. 56–57. Left palpus. 56. Mesal. 57. Ectal.

web; webs of the largest females often lack a stabilimentum. It may obscure the outline of the spider, which does not have a retreat but hangs in the center of the web (Plate II). However, there is no experimental evidence for this theory. The stabilimentum may help guide males to the female (Crome and Crome, 1961b). The frame of the web may extend on each side of the orb and may be strengthened by the spider. It is not periodically replaced, as is the viscid silk.

The genus *Gea* has been separated because the eyes of the anterior row are evenly spaced or closer to laterals. Often they are so in *Argiope*, and as this is an allometric growth character, it does not hold to separate juvenile specimens of the genera. Small *Argiope* and males (Figs. 53, 102, 162) have the same arrangement as does *Gea*. Adult *Argiope* generally have the anterior median eyes closer to each other than to the laterals, but they are only slightly closer in some species. The males of *Gea* have the first tibia curved and with strong, large setae (Fig. 18); those of *Argiope* are not modified (Fig. 73).

Color illustrations of the commonest species will be published in a forthcoming book (Levi and Levi, in press).

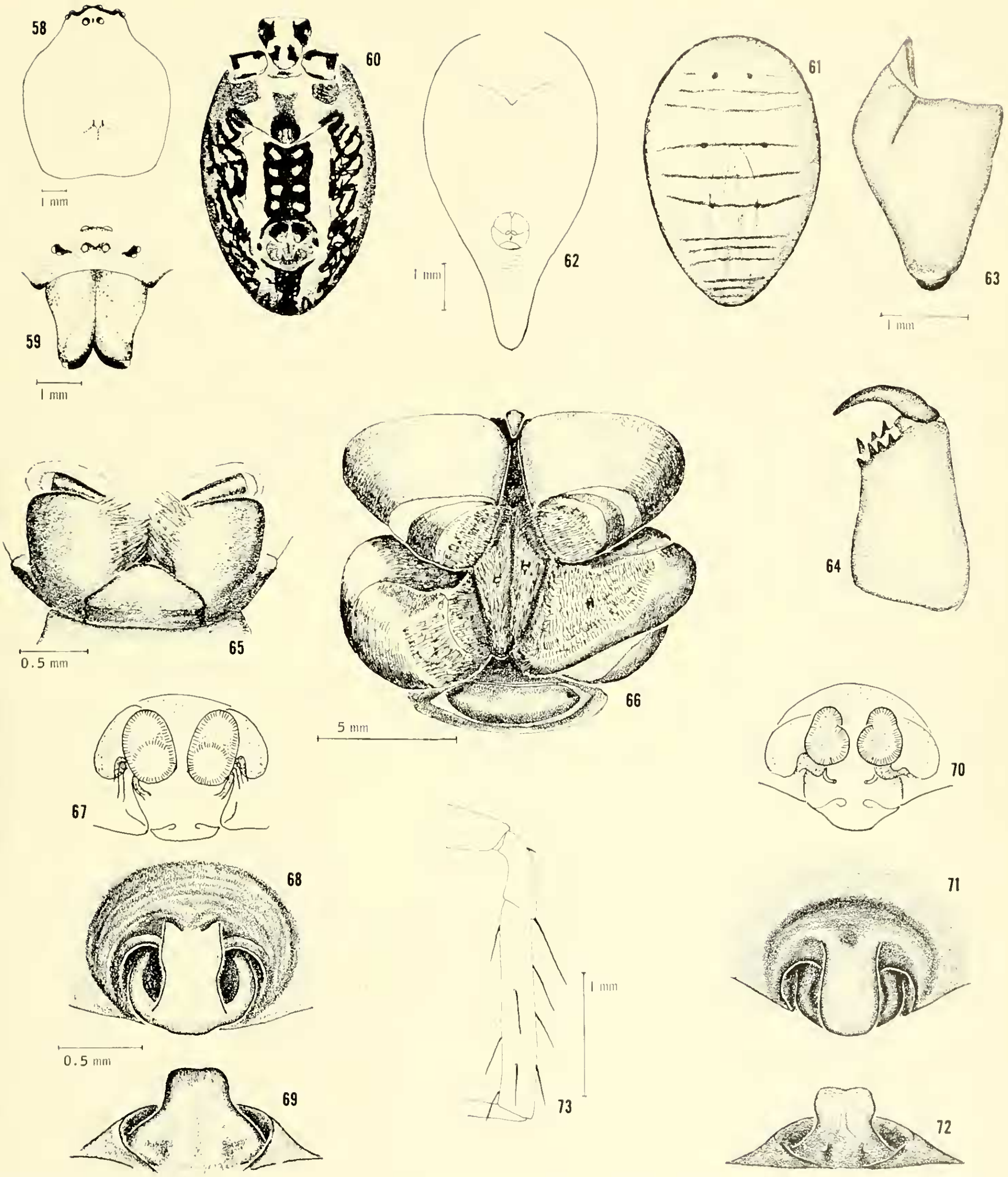
Palpus. The palpi of *Gea* and *Argiope* consist of the same parts seen in theridiid palpi (Figs. 39, 42). When I started to work on the family Theridiidae, I named the parts following other authors. It would have been wiser to study first the araneid palpi on which the anatomical names were based during the 19th century. I find now that what I called median apophysis in the theridiid palpus is not at all the same structure called median apophysis by Chyzer and Kulczynski (1891, *Aranea Hungariae*, Budapest, vol. I) in *Araneus diadematus*. As the parts of the araneid palpus were named long before those of the Theridiidae, it is necessary to change the names used for theridiid palpi to make them correspond; that is, to exchange the term median apophysis for radix and vice versa. The mistake was made presumably because the theridiid radix often is similar in appearance to the median apophysis of the Araneidae. Such similarity of two nonhomologous structures suggests similar function. The figure (fig. 12) I published of *Araneus* palpi (Levi, 1961, J. Morphol. 108: 4) after Comstock was poorly copied and incorrectly labelled.

On the mesal side of the palpus (Figs. 39–42) in *Argiope* and *Gea* is the radix (R) as in theridiids. The median apophysis (M) is a median structure seemingly of no function but of complex shape that differs in different species. In all *Argiope* and *Gea* the embolus (E) is large and lies within a large conductor (C). As in other Araneidae, there is an additional sclerite, the stipes (I), between the radix and the base of the embolus. But the terminal apophysis found in the palpi of *Araneus* species is lacking.

Growth. Crome and Crome (1961a) published the remarkable observation, based on sampling in the field, that the body of female *Argiope bruennichi* doubles its size after copulation without any intervening molt. Individuals with a large abdomen (ready to lay eggs) had a longer carapace and longer legs than individuals with a small abdomen (which presumably had just molted). There is some possibility that the observation is erroneous.

Crome indicated that this growth is allometric. However, plotting of Crome's own data on graph paper indicated that the growth is proportional.

A female *Argiope argentata* kept in the laboratory here had its first left leg removed 18 days after the last molt. The virgin female spider died 5½ months later of natural death. There were no measurable differences between the remaining right leg and the preserved leg. The female was the normal size of adult *A. argentata*, and all parts grew in the same proportion during the last molt (the skin was kept). The experiment was designed and carried out by W. Eberhard to test the Crome ob-



Argiope trifasciata (Forskål). Figs. 58–72. Female. Fig. 58. Carapace. Fig. 59. Eyes and chelicerae. Figs. 60–62. Abdomen. 60. Ventral view. 61. Dorsal view. 62. Ventral view from St. Croix, Virgin Islands. Figs. 63–64. Left chelicera. 63. Lateral view. 64. Posterior view. Fig. 65. Endites and labium. Fig. 66. Spinnerets. Figs. 67–69. Epigynum from Egypt. 67. Dorsal view. 68. Ventral view. 69. Posterior view. Figs. 70–72. Epigynum from Ontario. 70. Dorsal view. 71. Ventral view. 72. Posterior view.

Argiope argentata (Fabricius). Fig. 73. Male, prolateral view of patella and tibia of first left leg.

servations on one individual of another species.

Relationships. A number of characters including the large size and long metatarsi suggest relationship with *Nephila.* More likely both are adaptations to the habit of hanging in the web (Plates I, II) as the genitalia of the spiders and the structure of the web are quite different.

Among the species of *Argiope, A. trifasciata* (Figs. 60, 61) looks superficially much like *A. bruennichi. Argiope trifasciata*, although cosmopolitan, has not been collected with *A. bruennichi* and is not found in Europe; their ranges are mutually exclusive. However, the genitalia of the two species are quite different. The genitalia of the European *A. bruennichi* (Figs. 40, 41) are similar to those of *A. aurantia* (Figs. 56, 57), but the two are quite different in coloration. All other American species have genitalia similar to those of *A. trifasciata*, so similar that species may at times be difficult to separate on the basis of genitalia only. These other similar species are all sympatric with *A. trifasciata* but probably are limited to different habitats. Other *Argiope* similar to *A. trifasciata* are found in New Guinea and the East Indies (Chrysanthus, 1958, 1961). But, of course, the *Argiope* of India and Africa are not well known.

Most similar to *A. trifasciata* in coloration is *A. florida. Argiope florida* (Figs. 95–97) has some color characteristics found in juveniles (and males) of *A. argentata* (Figs. 128). There is some evidence of character displacement; the genitalia of *A. trifasciata* are noticeably small (Figs. 80–85) in those parts of the range where *A. florida* occurs. *Argiope florida* is found only in the southeastern United States. The three species, *A. argentata, A. savignyi* and *A. blanda* have similar color, similar genitalia and are sympatric; their habits are not known.

Habits. In connection with the habit of hanging in the middle of the web in broad daylight, often in the sun, one finds several characteristics that may be adaptive. The silver reflecting pigment, for instance, is found in some other Araneidae that hang in the web at daytime (e.g. *Leucauge, Tetragnatha*), also in the web parasites *Argyrodes* of the family Theridiidae. The large size may be an adaptation against water loss (the surface is relatively small compared to the volume). The long metatarsi are otherwise found only in *Nephila* which has similar habits and is also large, while the very different web and genitalia indicate that *Nephila* is not closely related to *Argiope*.

All species probably prey mainly on grasshoppers. I have observed more grasshoppers caught in an *A. trifasciata* web than the spider could possibly consume. Argiopes live less than a year; the female dies after making an egg-sac.

Studies on the life history and behavior of the European *Argiope bruennichi* have been made by Crome and Crome (1961a, b). Information on American species can be found in McCook (1889–1894), and observations on various species of *Argiope* have been published by Lewis and Eve (1965), Peters (1953), Richter (1960), and Wiehle (1931).

Misplaced Species

Argiope marxii McCook, 1894, American Spiders, 3: 223, pl. 1, fig. 5, ♀. Female holotype from Fort Yuma [Yuma], Arizona, in the U.S. National Museum, examined, [= *Cyrtophora molluccensis* (Doleschall)]. It was collected by Marx; as many of Marx's collecting labels are in error, we cannot be certain that the specimen actually came from Yuma. Another female of *Cyrtophora molluccensis* from Albu-

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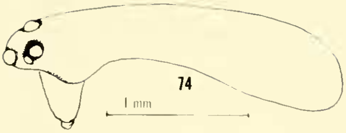
Argiope trifasciata (Forskål), male. Fig. 74. Carapace and chelicera. Fig. 75. Eyes, chelicerae and palpus. Fig. 76. Dorsal view. Figs. 77–79. Left embolus tip. 77. Egypt. 78–79. California. Figs. 80–91. Left palpus. 80–85. Florida. 86–88. Ontario. 89–91. Egypt. 80, 83, 86, 89. Mesal view. 81, 84, 87, 90. Ventral view. 82, 85, 88, 91. Ectal view.



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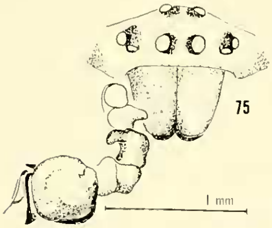

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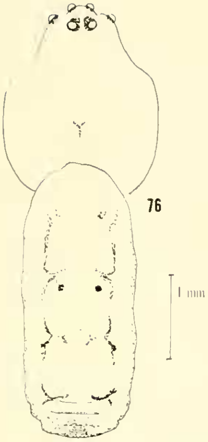

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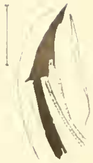

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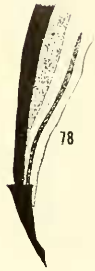

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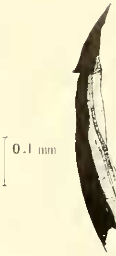

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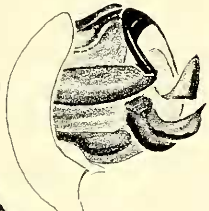

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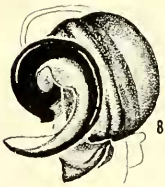

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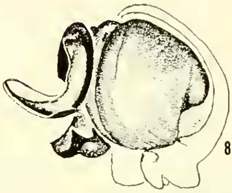

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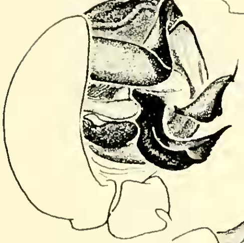

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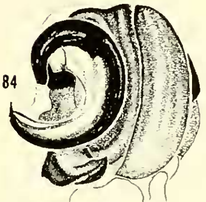

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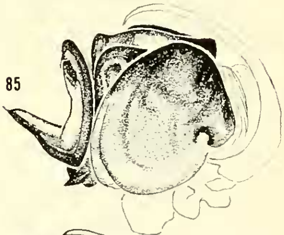

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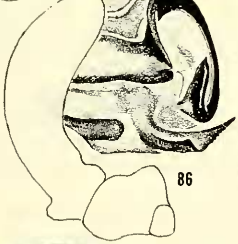

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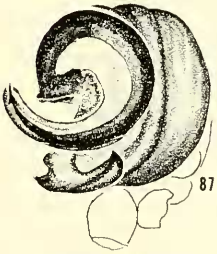

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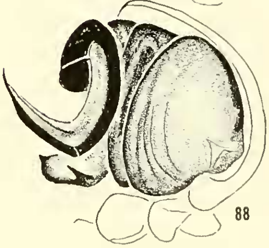

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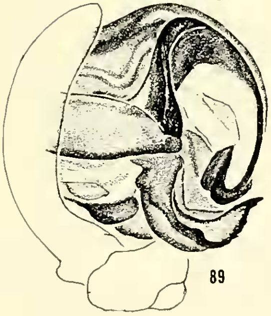

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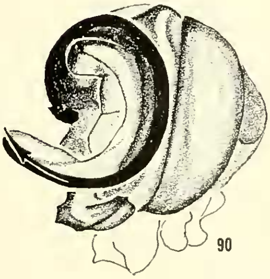

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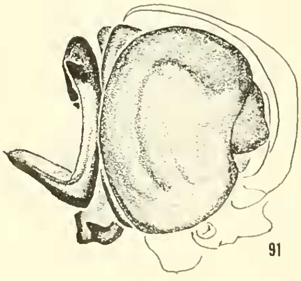

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querque, Arizona [*sic*] is in the Museum of Comparative Zoology, Banks collection.

Epeira fascinatrix Walckenaer, 1841, Histoire Naturelles des Insectes Aptères, 2: 111. Female holotype from Rio de Janeiro, collected by Freycinet, lost. This name may have to be applied to the common very large araneid found in the gardens of Rio de Janeiro. It is not an *Argiope*, but I am not certain to which genus the species belongs.

KEY TO NORTH AMERICAN *ARGIOPE*

Females

1a. Venter of abdomen with a white transverse band (Fig. 125); tropical species 2
1b. Venter of abdomen without white transverse band (Figs. 51, 160); temperate and tropical species 3
2a. Transverse band almost as wide as black area between band and epigynum (Fig. 144); posterior face of epigynum narrow without depressions (Fig. 142); Texas to Guatemala .... *blanda*
2b. Transverse band less than half width of black area anterior to it (Fig. 125); posterior face of epigynum relatively wide and with two depressions on its surface (Fig. 122); widespread, tropical .... *argentata*
3a. Sides of posterior half of abdomen lobed 4
3b. Sides of posterior half of abdomen without lobes 5
4a. Posterior half of dorsum of abdomen with two longitudinal parallel lines (Fig. 97); southeastern United States .... *florida*
4b. Posterior third of dorsum of abdomen almost entirely black (Fig. 161); Costa Rica to Bolivia .... *savignyi*
5a. Dorsum of abdomen black with yellow spots (Fig. 52) .... *aurantia*
5b. Dorsum of abdomen silvery with some transverse black lines, sometimes with some yellowish or orange marks (Fig. 61) .... *trifasciata*

Males

1a. Various sclerites projecting out from cymbium making the palpus much wider than long (Figs. 56, 57) .... *aurantia*
1b. Sclerites of palpus not projecting but more or less curled 2
2a. A small spur near tip of palpal embolus (Figs. 130–133, 135, 136) .... *argentata*
2b. No spur near tip of embolus 3
3a. A large spur present on the distal face of the median apophysis (Figs. 149, 165); tropical America 4
3b. No spur or only a small spur (Fig. 106) on distal face of median apophysis 5
4a. A large thorn at base of palpal embolus (Figs. 149–151); Texas to Guatemala .... *blanda*
4b. Without thorn at base of palpal embolus (Figs. 165–167); Costa Rica to Bolivia .... *savignyi*
5a. Diameter of palpus greater than 0.6 mm; coil of embolus large, tip almost straight (Figs. 107, 110); southeastern United States .... *florida*
5b. Diameter of palpus less than 0.5 mm; coil of embolus small, tip curved (Figs. 81, 84, 87, 90); Canada to Chile .... *trifasciata*

Argiope lobata (Pallas) Lobed Argiope

Figures 25–38

Aranea lobata Pallas, 1772, Spicilegia Zoologica, 9: 46. Holotype from unknown locality [presumably from the Ukraine], lost.

Argiope lobata,—Simon, 1870, Ann. Soc. Entomol. France, (4) 10: xcv. Kolosváry, 1938, Zool. Anz., 123: 22–25. Bonnet, 1955, Bibliographia Araneorum, 2: 687. Levi and Levi, Spiders and their Kin, p. 69 (in press).

The name *Argiope lobata* is applied to the common Mediterranean species found also in southern Russia. I have examined specimens from Kazakhtan, Kazakh, USSR, France and North Africa. No two looked alike (Figs. 25–35) and all seemed sufficiently different to be considered different species on first impression. However, large series of the spiders were examined by Kolosváry (1938) who illustrated 83 different epigyna showing all kinds of intergrades. There seems to be both geographical and individual variation. Kolosváry, in one of the few studies of variation of European spiders, considered all of them to

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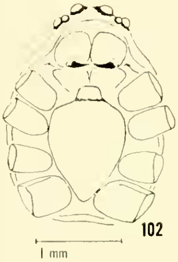
Argiope florida Chamberlin and Ivie. Figs. 92–101. Female. 92. Sternum and coxae. 93. Carapace. 94. Eyes and chelicerae. 95. Abdomen of juvenile female. 96. Ventral view of abdomen. 97. Dorsal view of abdomen. 98–101. Epigynum. 98. Dorsal view. 99. Lateral view. 100. Ventral view. 101. Posterior view. Figs. 102–111. Male. 102. Sternum and coxae. 103. Dorsal view. 104, 105. Tip of left embolus. 106–111. Left palpus. 106, 109. Mesal view. 107, 110. Ventral view. 108, 111. Ectal view.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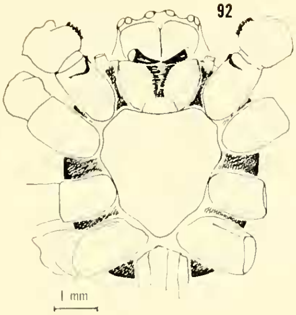
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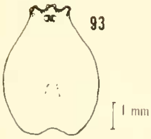
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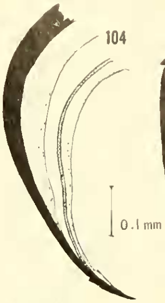
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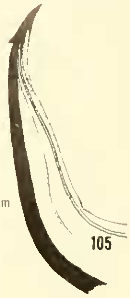
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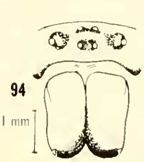
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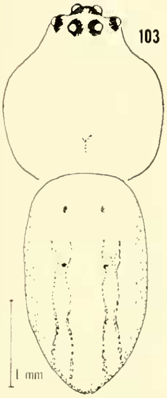
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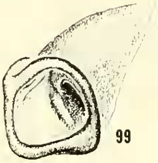
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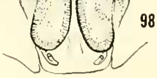
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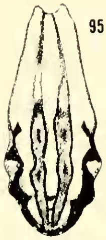
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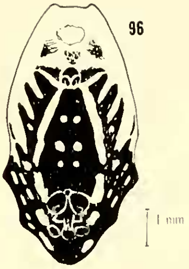
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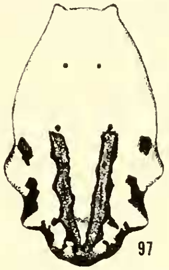
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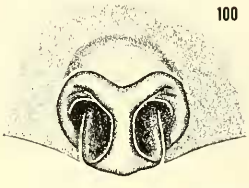
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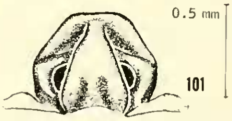
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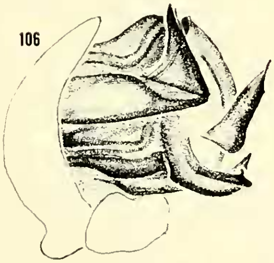
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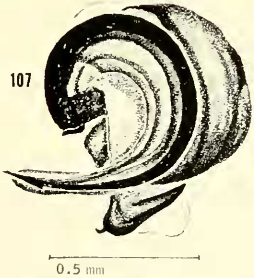
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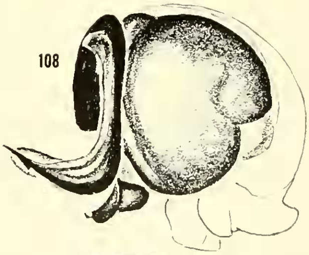
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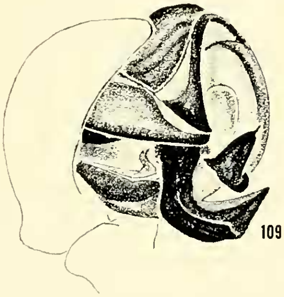
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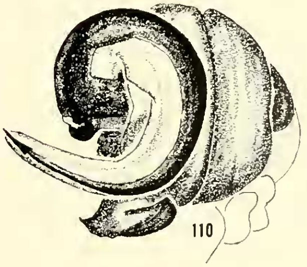
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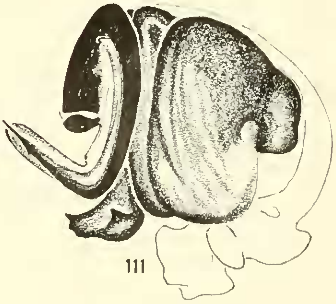
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belong to one species. His argument is convincing.

The species has a greenish color in alcohol. Color slides made available by Mr. R. König show that the dorsum of the carapace and abdomen (Fig. 36) is silvery in living specimens (Levi and Levi, in press).

Argiope aurantia Lucas
Black and Yellow Argiope
Figures 43–57; Map 2

Argyope aurantia Lucas, 1833, Ann. Soc. Entomol. France, 2: 86, pl. 5, fig. 1, ♀. Female holotype from North America probably in the Muséum National d'Histoire Naturelle, Paris. Not seen.

Nephila vestita C. L. Koch, 1839, Die Arachniden, 5: 35, pl. 358, ♀. Female holotype, locality unknown, presumably in the Berlin Museum.

Epeira cophinaria Walckenaer, 1841, Histoire Naturelle des Insectes, Aptères, 2: 109. Holotype, Abbot illustration no. 151, from Georgia, in British Museum; color photograph of original examined.

Epeira ambitoria Walckenaer, 1841, *ibid.*, 2: 112. New name for *Nephila vestita* Koch from New York.

Epeira riparia Hentz, 1847, J. Boston Soc. Natur. Hist., 5: 468, pl. 30, fig. 5, ♀. Female holotype from United States, lost.

Epeira sutrix Hentz, 1847, *ibid.*, 5: 478, pl. 31, fig. 23, ♀. Juvenile female syntypes from South Carolina and Pennsylvania, lost.

Argiope riparia, Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 329, pl. 34, fig. 19, ♀, pl. 38, figs. 13, 14, 19, ♀♂.

Argiope riparia var. *multiconcha* Treat, 1887, Amer. Natur., 21: 1122. Female holotype from Guthrie, Missouri.

Argiope personata O. P.—Cambridge, 1893, Biologia Centrali-Americana, Araneidea, 1: 110, pl. 14, fig. 14, ♀. Female holotype from Acapulco, Mexico, in the British Museum.

Argiope cophinaria,—McCook, 1893, American Spiders, 3: 217, pl. 15, figs. 1–6; pl. 16, figs. 1, 5, 6, ♀♂.

Argiope aurantia,—Simon, 1895, Histoire Naturelles des Araignées, 1: 765, 767. Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv., 70: 221, figs. 717–721. Bonnet, 1955, Bibliographia Araneorum, 2: 675. Levi and Levi, Spiders and their Kin, p. 69 (in press).

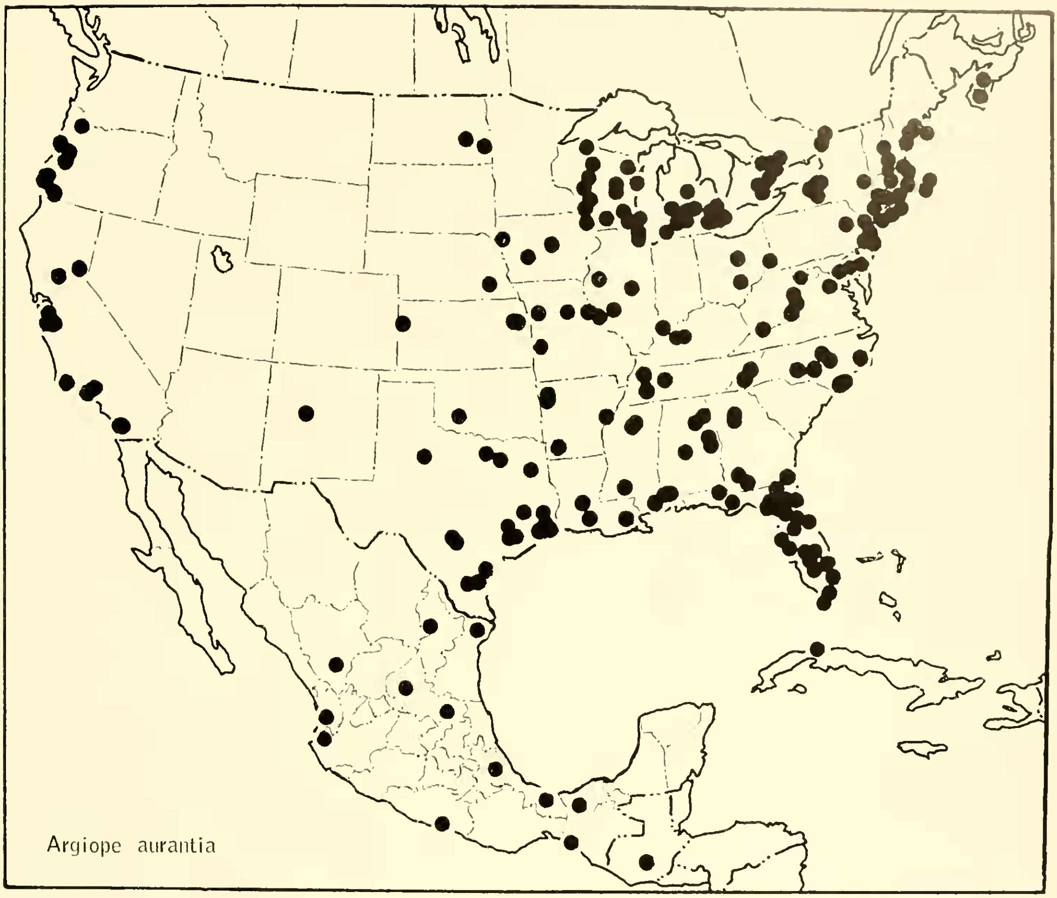
Argiope godmani O. P.-Cambridge, 1898, Biologia Centrali-Americana, Araneidea, 1: 236, pl. 37, fig. 8. Female holotype from Guatemala City, Guatemala, in the British Museum.

Miranda cophinaria,—F. P.-Cambridge, 1903, Biologia Centrali-Americana, Araneidea, 2: 452, pl. 43, figs. 4, 5, ♀♂.

Description. Male, specimen described from Michigan. Carapace brown with white hairs. Sternum black with white median longitudinal band. Legs brown. Dorsum of abdomen black with an indistinct yellow-white longitudinal band on each side (Fig. 54). Venter black with two indistinct longitudinal lines. Anterior median eyes about one and one-half diameters apart, one diameter from laterals; posterior median eyes one and one-half diameters apart, two diameters from laterals. Sides of abdomen almost parallel to each other (Fig. 54). Total length 5.5 mm. Carapace 2.7 mm long, 1.8 mm wide. First femur, 4.3 mm; patella and tibia, 5.0 mm; metatarsus, 5.0 mm; tarsus, 1.5 mm: Second patella and tibia, 4.8 mm; third, 2.4 mm; fourth, 3.9 mm.

Female, specimen described from Michigan. Carapace yellow-white with some brown markings covered up by white hair, eye region black. Sternum black with median longitudinal yellow-white band (Fig. 51). Legs are banded dark brown; the brown bands are wider than in-between light areas. Dorsum of abdomen is shiny black with yellow markings (Fig. 52). Venter with two longitudinal white bands enclosing four small pairs of white spots on black (Fig. 51). Anterior median eyes about one and one-half diameters apart, one and one-half diameters from laterals; posterior median eyes two diameters apart, three diameters from laterals. Abdomen is shield-shaped with two anterior projections. Total length 18 mm. Carapace 15.9 mm long, 4.3 mm wide. First femur, 7.4 mm; patella and tibia, 8.0 mm; metatarsus, 6.8 mm; tarsus, 1.8 mm. Second patella and tibia, 7.6 mm; third, 4.3 mm; fourth, 7.2 mm. Range of size of females between 14 and 25 mm. Largest specimens are from the Southwest and Mexico.

Diagnosis. The species is closest to the European *A. bruennichi*, which has a similar palpus and (Figs. 39–41) also has an epigynum with a scape, but *A. bruennichi* has the coloration of *Argiope trifasciata*



Map 2. Distribution of *Argiope aurantia* Lucas.

(Fig. 61) while *A. aurantia* is brightly colored yellow and black (Fig. 52).

Habits. Males are mature in July and August, females from August to December in Florida. In Wisconsin and Michigan males are mature in August, females presumably from August to October. For New England, Kaston (1948) reported mature males in late July and August, females from August to October with the first cocoons appearing in August and September.

In Florida, all collecting reports with habitat information indicate that the species is limited to margins of lakes, stream banks, near ponds or sinks in swamps, rarely in sand scrub. Also in Michigan at the George Reserve, *A. aurantia* is limited to swamps, bogs and pond margins; this is probably true also for Wisconsin. In New England *A. trifasciata* and *A. aurantia* are found in similar habitats, meadows containing high grass and goldenrod (*Solidago* sp.). Both species were very abundant from 1956 to 1957 but rapidly disappeared with the onset of the recent (1960–1966) drought, *A. aurantia* being first to disappear. Both species reappeared in large numbers during the wet summer of 1967.

The web has a single zig-zag stabilimentum that extends above and below the center. The egg cocoon is a brown sphere of papery consistency attached at its top end. Each sphere contains 400 to 1000 yellow eggs. Young instars overwinter in the egg cocoon and emerge in April or May (Kaston, 1948).

Distribution (Map 2). Nova Scotia, southern Ontario, south to Guatemala City, Guatemala, but absent from predominantly arid areas. There is a literature record from El Salvador (Peters, 1953) indicating that it is found in hot lowlands along the coast, disappearing in fall.

Argiope trifasciata (Forskål)
Banded Argiope
Plate I; Figures 58–72, 74–91; Map 3

Aranea trifasciata Forskål, 1775, Descriptiones Animalium Avium, Amphibiorum, Piscium, Insectorum, Vermum, Hauniae, p. 86. Holotype from Cairo [Egypt], lost.

Aranea fastuosa Olivier, 1789, Encycl. Méthod., 4: 202. Syntypes from Guadalupe.

Argyope aurelia Audouin, 1827, Explication sommaire des Planches d'Arachnides, *in* Savigny, Description de l'Egypt., 22: 331, pl. 2, fig. 5, ♀♂. Syntypes from Egypt.

Epeira webbii Lucas, 1838, *in* Barker, Webb, Berthelot, Histoire Naturelle des Iles Canaries, 2: 38, pl. 6, fig. 5, ♀. Syntypes from Canary Islands.

Epeira argyraspides Walckenaer, 1841, Histoire Naturelle des Insectes, Aptères, 2: 110. Female holotype is Abbot illustration, fig. 156, in the British Museum; color photograph examined.

Epeira fasciata,—Hentz, 1847, J. Boston Soc. Natur. Hist., 5: 468, pl. 30, fig. 8, ♀. Not *Epeira fasciata* (= *A. bruennichi*).

Epeira flavipes Nicolet, 1849, *in* Gay, Historia Chili, 10 (3): 493. Specimens from Valdivia, Chile, probably in the Muséum National d'Histoire Naturelle, Paris.

Argyope avara Thorell, 1859, Öfvers Kongl. Vet. Akad. Förh., 16: 299. Female syntypes from San Francisco, California, and Oahu, Honolulu, in the Natural History Museum, Stockholm, examined. The California specimen is in poor condition, the Hawaiian specimen in excellent physical condition. Bonnet, 1955, Bibliographia Araneorum, 2: 677 (sub *Argiope*). NEW SYNONYMY.

Argiope trifasciata,—Thorell, 1873, Remarks on Synonyms of European Spiders, p. 519. Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv. 70: 222, figs. 697–699, 722–723, 2034–2035, ♀♂. Bonnet, 1955, Bibliographia Araneorum, 2: 694. Levi and Levi, Spiders and their Kin, p. 68. (in press)

Argiope sticticalis O. P.-Cambridge, 1876, Proc. Zool. Soc. London, p. 576. Juvenile syntypes from Egypt probably at the Hope Dept. of Entomology, Oxford.

Argyopes indecissa Holmberg, 1876, An. Agr. Rep. Argentina, 4: 112. Female specimens presumably from Buenos Aires, lost.

Argiope hentzi Thorell, 1878, Ann. Mus. Civ. Genova, 13: 295. New name for *A. fasciata*,—Hentz.

Argiope transversa Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 330, pl. 34, fig. 20; pl. 28, figs. 15–18, ♀♂. New name for *A. fasciata*,—Hentz.

Argiope argyraspis,—McCook, 1894, American Spiders, 3: 219, pl. 15, figs. 7–12; pl. 16, figs. 3–4, ♀♂.

Metargyope trifasciata,—F. P.-Cambridge, 1903, Biologia Centrali-Americana, Araneidea, 2: 451, pl. 43, figs. 2, 3, ♀♂

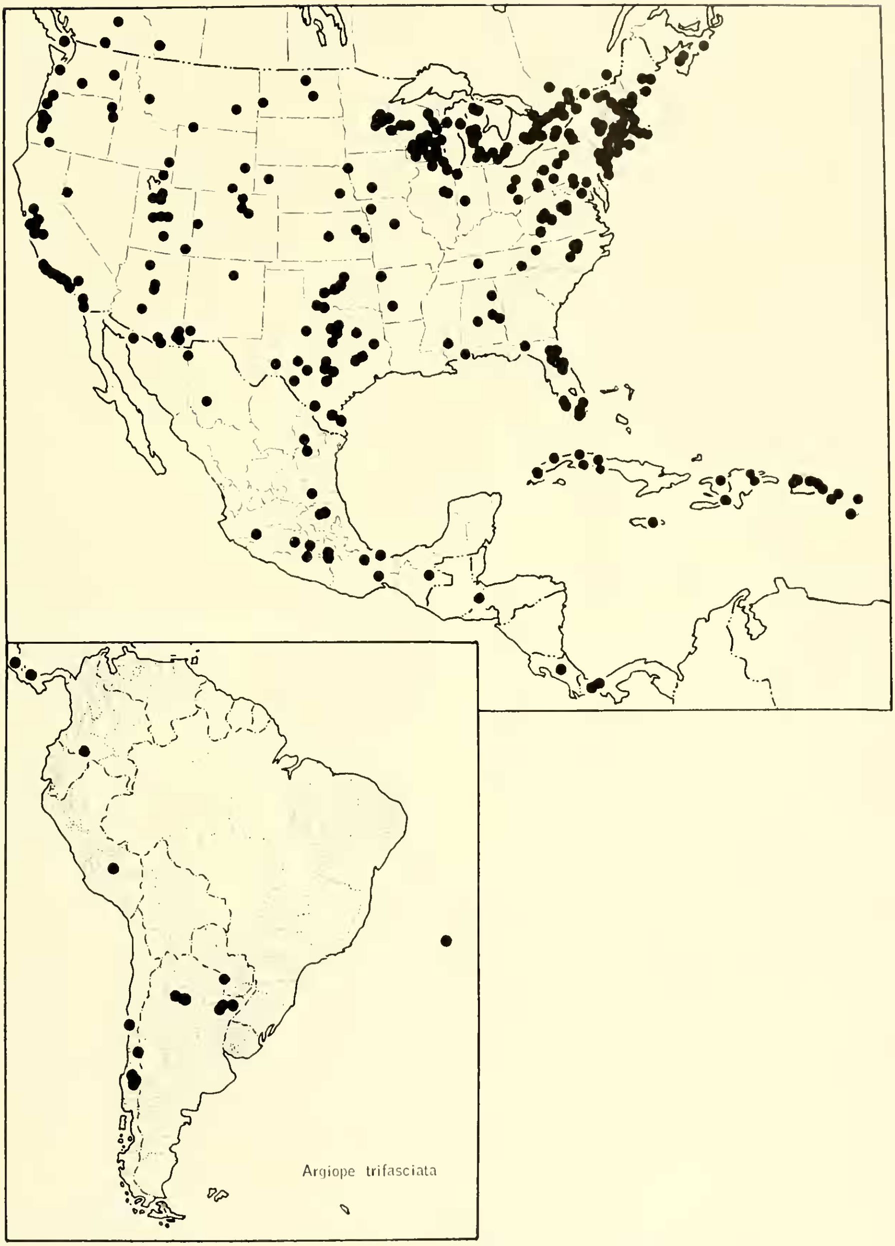
Argiope simplex Badcock, 1932, J. Linnean Soc. London, 38: 17, fig. 12. Female holotype from Rio Verde, 6 miles north of Makthlawaiya, Paraguay, in the British Museum, examined by D. J. Clark. NEW SYNONYMY.

Argiope abalosi Mello-Leitão, 1942, Rev. Mus. La Plata, (N.S.) 2: 399. Juvenile holotype from Luján, Santiago del Estero in the Museo de la Plata, examined. NEW SYNONYMY.

Argiope seminola Chamberlin and Ivie, 1944, Bull. Univ. Utah, Biol. Ser., 8 (5): 96, figs. 98–102, ♀♂. Female holotype from 10 miles east of Naples, Florida, probably in the University of Utah collection, not seen. NEW SYNONYMY.

Argiope stenogastra Mello-Leitão, 1945, Rev. Mus. La Plata, (N.S.) 4: 235. Juvenile holotype from Solari, Corrientes, in the Museo de la Plata, examined. NEW SYNONYMY.

Description. Male, specimen described from North Carolina. Carapace yellow-brown. Sternum yellow-brown with white spot opposite each coxa surrounded by some dark pigment. A white spot behind labium. Legs yellowish brown. Dorsum of abdomen white. Venter with pigment spots and two white lines bordered by narrow black ones. Anterior median eyes about one and one-half diameters apart. Posterior eyes a little more than two diameters apart. Sides of the abdomen almost parallel (Fig. 76). Total length 5.5 mm. Carapace 3.0 mm long, 2.1 mm wide. First femur, 4.6 mm; patella and tibia, 5.8 mm; metatarsus, 5.6 mm; tarsus, 1.6 mm. Second patella and tibia, 5.0 mm; third, 2.0 mm; fourth, 4.2



Map 3. American distribution of *Argiope trifasciata* (Forskål).

mm. Total length of a male from the West Indies 5.8 mm. Carapace 2.7 mm long, 2.3 mm wide. First patella and tibia, 4.3 mm; second, 4.0 mm; third, 1.7 mm; fourth, 3.1 mm.

Female, specimen described from North Carolina. Carapace dark with white scales. Sternum black with a median white longitudinal band and two white spots on each side (Fig. 60). Legs dark brown with dark brown bands as wide as lighter areas between. Abdomen white with transverse dark lines (Fig. 61). Venter black with two parallel white lines enclosing a black area which contains four pairs of white spots (Fig. 60). Anterior median eyes one and one-quarter diameters apart, one and one-half diameters from laterals. Posterior eyes a little less than two diameters apart. Abdomen oval in shape, sometimes posterior tip overhanging way beyond the spinnerets (Fig. 62). Total length, 17 mm. Carapace 5.5 mm long, 4.0 mm wide. First femur, 7.6 mm; patella and tibia, 8.2 mm; metatarsus, 8.2 mm; tarsus, 2.1 mm. Second patella and tibia, 8.1 mm; third, 4.2 mm; fourth, 7.0 mm.

Total length of a female from the West Indies 24 mm. Carapace 7.4 mm long, 6.3 mm wide. First femur, 10.1 mm; patella and tibia, 11.0 mm; metatarsus, 12.5 mm; tarsus, 2.4 mm. Second patella and tibia, 11.0 mm; third, 5.9 mm; fourth, 8.9 mm.

Variations. Females range in size from 12–26 mm. The smallest specimens came from southern South America, the largest ones from the West Indies and Mexico. The West Indian specimens had the most overhanging tails (Fig. 62).

Diagnosis. Male *Argiope trifasciata* have been confused with *A. florida*. However, the embolus has a diameter of less than 0.5 mm (Figs. 81, 84, 87, 90); that of *A. florida* is more than 0.6 mm (Figs. 107, 110). The embolus lacks the small spur that projects near the tip in *A. argentata* (Figs. 130–133). Females can be separated from other species by lack of a transverse lip anterior to the septum of the epigynum (Figs. 68, 71).

Habits. Males are mature from June until November in Florida, females from June until December. In Wisconsin and Michigan males are found from August until September, females from August until October. In Connecticut, males are mature from July to September, females from August until frost (Kaston, 1948); the dates are about the same in other parts of New England.

In Florida the animals are found in high dry grass areas and weeds, in low brush in pines, in sand scrub, all much drier habitats than that of *A. aurantia*. All collections in Michigan came from upland fields, rarely moist fields. Kaston (1948) reports *A. trifasciata* and *A. aurantia* from similar situations but less common than *A. aurantia* in Connecticut. In the areas of eastern Connecticut and eastern Massachusetts that I have lived in, *A. trifasciata* was more common than *A. aurantia* but had similar habitats. While both species were very common in 1956–1957, both almost disappeared, perhaps as a result of the recent (1960–1966) drought. Individuals of *A. trifasciata* were found occasionally during the drought. They reappeared in abundance during the summer of 1967.

In large collections from the West Indies, *Gea heptagon* was commonly collected with *Argiope argentata*. But *Gea* and *A. trifasciata* were never collected together.

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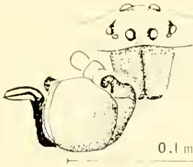
Argiope argentata (Fabricius). Figs. 112–125. Female. 112. Carapace. 113. Eyes and chelicerae. 114–115. First left coxa and trochanter. 116–118. Left chelicera. 116. Posterior view. 117. Anterior view. 118. Lateral view. 119–124. Epigynum. 119–122. Veracruz, Mexico. 119. Lateral view. 120. Dorsal view. 121. Ventral view with embolus tip. 122. Posterior view. 123. Ventral view from slightly posterior, Florida. 124. Ventral view, Lima, Peru. 125. Abdomen, ventral view. 126. Abdomen, dorsal view. Figs. 127–136. Male. 127. Eyes, chelicerae and palpus. 128. Dorsal view. 129. Lateral view of carapace. 130–132. Embolus tips. 130, 131. From right side of epigynum, from Peru. 132–133. Right tips, Mexico. 134–136. Left palpus. 134. Mesal view. 135. Ventral view. 136. Lateral view.



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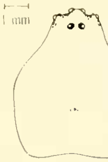

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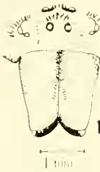

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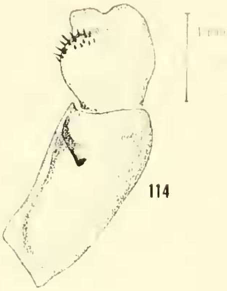

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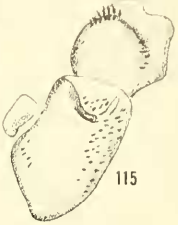

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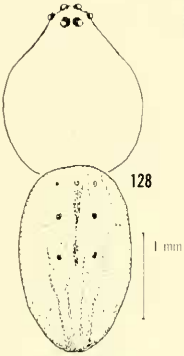

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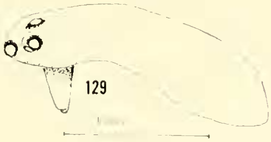

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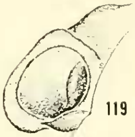

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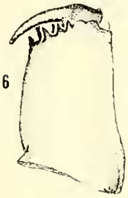

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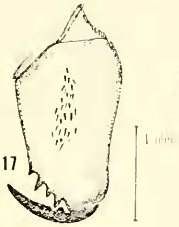

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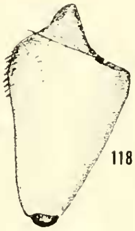

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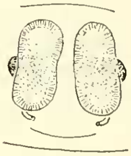

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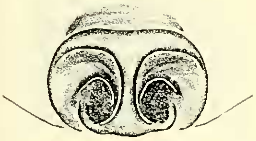

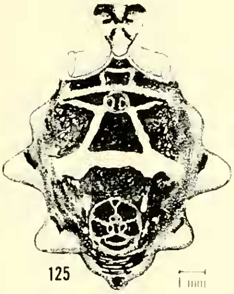

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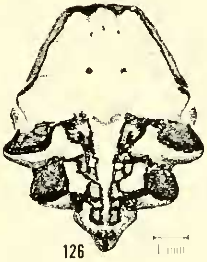

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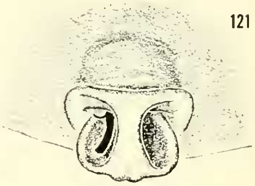

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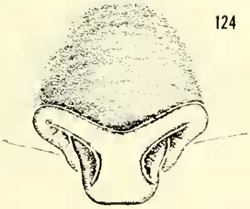

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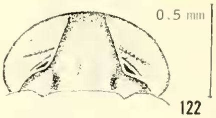

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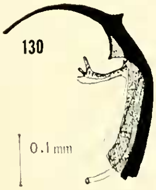

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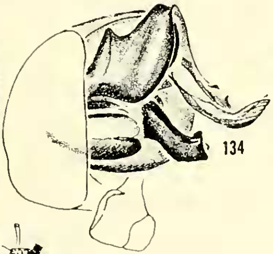

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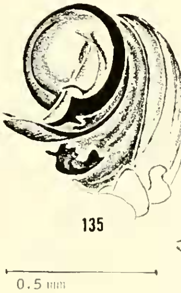

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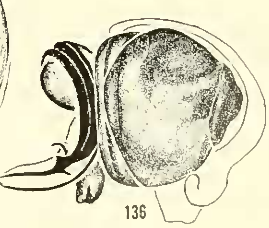

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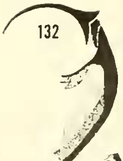

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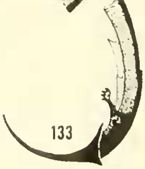

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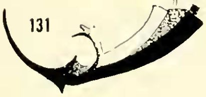

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The web has a vertical stabilimentum above and below the spider; sometimes it is lacking (Kaston, 1948). The egg-sac is made in fall and soon afterward the female dies. The sac is brown, the eggs yellow, more than 100 of them in a sac (Kaston, 1948). In New England there is just one generation a year. The egg-sac is papery, flat above and rounded below. The young spiderlings in spring resemble young tetragnathids but do not have long jaws and the venter of the abdomen has a black longitudinal band.

Distribution. Cosmopolitan but absent from areas where *A. bruennichi* is found. It has been reported from the Mediterranean, Angola and Natal, Madagascar, Asia Minor, Indian Ocean islands, Malay Peninsula, Australia, New Caledonia, New Hebrides, Fiji (Bonnet, 1955). In the Americas, it occurs from Nova Scotia and British Columbia, to southern Chile and northern Argentina, and Hawaii, but apparently it is absent from large areas that are covered by tropical forests (Map 3).

The distribution of *A. trifasciata* is unknown, because it may have been confused with *A. bruennichi* of Eurasia and other names may have been applied to it. It appears to be almost cosmopolitan. Specimens examined from the Mediterranean region came from Madeira, Porto Santo (T. D. A. Cockerell). African specimens examined were from Egypt; and from Faradje, Republic of the Congo (American Museum Congo Expedition). Atlantic Ocean islands: Madeira, Isla da Trinidade (Brazil) and St. Helena Island (A. Loveridge). It is a common species on St. Helena. Australian Pacific area: Eromanga Island, New Hebrides (L. MacMillan), Western Australia (B. Y. Main).

There are literature records from the lower Amazon (F. P.-Cambridge, 1903) and Guyana, Brazil, and the Antarctic (Bonnet, 1955). The Antarctic record turned out to be an error: it was collected by the British Expedition to the Antarctic Continent on Trinidad Island off the coast of Brazil. No spiders are known from the Antarctic.

Argiope florida Chamberlin and Ivie
Florida Argiope
Plate II; Figures 92–111; Map 4

Argiope argentata,—McCook, 1894, American Spiders, 3: 220 (in part), pl. 16, fig. 1, ♀. Not *A. argentata* (Fabricius).

Argiope florida Chamberlin and Ivie, 1944, Bull. Univ. Utah, Biol. Ser., 8 (5): 95, figs. 93, 94, 96, ♀. Female holotype from Lake Worth, Florida, found in webs of large cacti probably in the University of Utah collection, not seen.

Argiope seminola,—Chamberlin and Ivie, 1944, *ibid.*, 8 (5): 96, figs. 100, 102, ♂. Not ♀ holotype.

Note: The male figured by Chamberlin and Ivie as *A. florida* seems to be a specimen of *A. trifasciata*; the male figured as *A. seminola* is *A. florida.* Figure 551 of Abbot, interpreted as *A. seminola* (= *A. trifasciata*) by Chamberlin and Ivie, is no doubt *A. florida.* The species seems to have been confused with *A. argentata.*

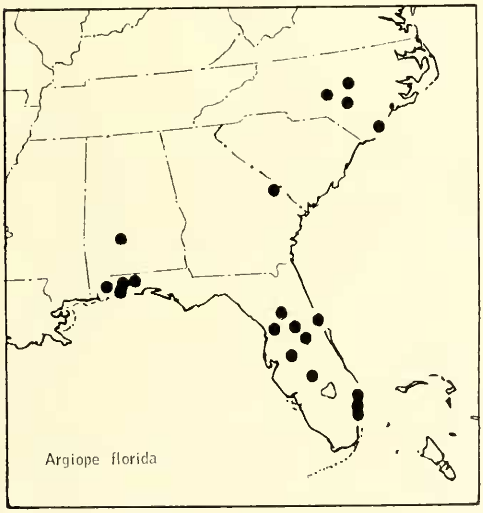
Description: Male. Carapace light brown. Labium, maxillae brown. Sternum dark on each side, legs brown. Abdomen dorsum with two longitudinal bands on some silver (Fig. 103), venter black with two white longitudinal bands. There are no lobes on the sides of the abdomen (Fig. 103). Total length, 4.5 mm. Carapace 2.2 mm long; 2.1 mm wide. First femur, 3.5 mm; patella and tibia, 4.2 mm; metatarsus, 4.0 mm; tarsus, 1.3 mm. Second patella and tibia, 3.8 mm; third, 1.8 mm; fourth, 2.9 mm.

Female. Carapace completely covered by long silvery scales on dark brown background. Chelicerae, labium, maxillae dark brown with labium and maxillae having the distal rim light. Sternum dark brown with median light mark which forks posteriorly into 3 prongs. Legs dark brown with lighter rings as wide as dark areas and some white scales on venter. Dorsum of abdomen silvery with silvery scales on white background except two longitudinal dark stripes at the posterior half of the abdomen (Fig. 97), and the anterior face of the lateral lobes is black. The venter has two longitudinal white lines on black background, broken in the posterior part of the abdomen and going around spinnerets. Total length, 16 mm. Carapace 10 mm long, 8.0 mm wide. First femur, 8.1 mm; patella and tibia, 8.7 mm; metatarsus, 8.2 mm; tarsus, 2.3 mm. Second patella and tibia, 8.6 mm; third, 5.0 mm; fourth, 7.6 mm.

Diagnosis: Females are easily recognized by the posterior lateral lobes on the abdomen and the two dark dorsal lines (Fig. 97). The anterior edge of the epigynum has a lip (Fig. 100) while that of *A. trifasciata* (Figs. 68, 71) does not. The palpus of the male (Figs. 107, 110) has a diameter of more than 0.6 mm, that of *A. trifasciata* less than 0.5 mm (Figs. 81, 84, 87, 90). It lacks the spur near the tip of the embolus of *A. argentata*.

Habits: The males mature from June to October, the females from July to November. The webs are found in dry sand scrub in longleaf pine and oak-pine flat woods in Florida. There are four stabilimenta in form of a cross (Plate II) as in *A. argentata*.

Distribution: From North Carolina, Alabama, to southern Florida (Map 4).



Map 4. Distribution of *Argiope florida* Chamberlin and Ivie.

Argiope argentata (Fabricius)
Silver Argiope

Plate I; Figures 42, 73, 112–136; Map 5

Aranea argentata Fabricius, 1775, Systema Entomologiae, p. 433. "Habitat in Indiis," type specimens lost. Martini and Goeze, 1778, *in* D. M. Lister, Naturgeschichte der Spinnen, p. 248, "Indianische Silberspinne" [American Indian silver spider]. Fabricius, 1781, Species Insectorum exhibentes eorum differentias auctorum, 2: 539, "Indiis." Gmelin, 1789, C. A. Linné, Systema Naturae, 1 (5): 2953, "Habitat America australi insulique obversis et India." Olivier, 1789, Araignées *in* Encycl. Méth. Hist. Natur. Ins., Paris, 4: 234, "Elle se trouve aux Indes orientales." Fabricius, 1793, Entomologia Systematica emendata, 2: 414, "Habitat in India."

Aranea mammata De Geer, 1778, Mem. Hist. Insectes, 7: 318, pl. 39, fig. 5. Specimens from Pennsylvania [prob. an error] and figured by Sloane from Jamaica.

Argyopes argentata,—C. L. Koch, 1839, Die Arachniden, 5: 38, pl. 361, from "Südamerika"; Holmberg, 1876, An. Agr. Argentina, 4: 112.

Argyopes fenestrinus C. L. Koch, 1939, *ibid.*, 5: 39, fig. 361. Holotype from South America.

Epeira amictoria Walckenaer, 1841, Histoire Naturelle des Insectes, Aptères, 2: 119. Holotype from Rio de Janeiro, Brazil.

Plectana sloanii Walckenaer, 1841, *ibid.*, 2: 200. Name for a figure by Sloane, History of Jamaica, pl. 235, fig. 3.

Argyopes hirtus Taczanowski, 1879, Horae Soc. Entomol. Rossicae, 15: 103, pl. 1, fig. 23, ♀. Female syntypes from Lima, Chorillas and Callao, Peru. Female lectotype from Lima, Peru, here designated in the Polish Academy of Sciences, Warsaw, examined. NEW SYNONYMY.

Argyopes maronicus Taczanowski, 1873, Horae Soc. Entomol. Rossicae, 9: 261. Female holotype from St. Laurent de Maroni, French Guiana, in the Polish Academy of Sciences, Warsaw.

Argyopes subtilis Taczanowski, 1873, *ibid.*, 9: 261. Female syntypes from Cayenne, French Guiana, in the Polish Academy of Sciences, Warsaw.

Argiope argentata,—McCook, 1893, American Spiders, 3: 220, pl. 16 (in part), fig. 1 (in part), 2. Bonnet, 1955, Bibliographia Araneorum, 2: 673. Levi and Levi, Spiders and their Kin, p. 69 (in press).

Argiope waughi Simon, 1897, Act. Soc. Sci. Chili, 6: 105. No specimens with this name could be found in the Simon collection (M. Vachon in letter). NEW SYNONYMY.

Argyope argentata,—F. P.-Cambridge, 1903, Biologia Centrali-Americana, Araneidea, 2: 450, pl.

42, figs. 25, 26, ♀♂. Roewer, 1942, Katalog der Araneae, 1: 744.

Argiope submaronica Strand, 1915, Arch. Naturgesch. 81A (9): 105. Female holotype from "Joinville, Sta. Catherina, Brasilien," depository unknown. This name was first synonymized with *A. argentata* by Bonnet.

Gea panamensis Chamberlin, 1916, Bull. Mus. Comp. Zool., 60: 243, pl. 19, fig. 8. Male holotype from Panama in the Museum of Comparative Zoology, examined. NEW SYNONYMY.

Argiope filiargentata Hingston, 1932, A Naturalist in the Guiana Forest, pp. 132, 372. Trinidad. Hingston neither kept his specimens nor designated types. All his specimens seem to be juvenile *A. argentata*. NEW SYNONYMY.

Argiope cuyunii Hingston, 1932, *ibid.*, pp. 133, 373. Cuyuni River, British Guiana (see above). NEW SYNONYMY.

Argiope filiinfracta Hingston, 1932, *ibid.*, p. 373. Trinidad (see above). NEW SYNONYMY.

Argiope argyrea Badcock, 1932, J. Linnean Soc. London, p. 17. Female holotype from Nanahua, Paraguay, in the British Museum, examined by D. J. Clark. NEW SYNONYMY.

Argiope indistincta Mello-Leitão, 1944, Rev. Mus. La Plata, (N.S.) 3: 328. Male holotype from Rosas Costa, Prov. Buenos Aires, in the Museo de la Plata, examined. NEW SYNONYMY.

Note: Apparently the Fabricius type locality was understood to be America by most of his contemporaries, although this is not at all clear. Considering that for more than 150 years the name has been used for the common tropical American species, this is of academic interest only.

Hingston's diagrammatic illustrations of the web of juvenile *Argiope argentata* (to all of which he gave new names), have unfortunately been reproduced in numerous books including Grassé, P., edit., 1949, *Traité de Zoologie*, 6: 692.

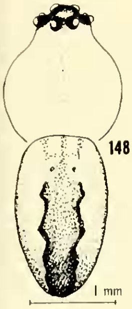
Description. Male specimen described is from St. Croix, British West Indies. Carapace yellow-white with two indistinct longitudinal brownish bands going from each side of eye region, posteriorly, about their width apart. Sternum yellowish white with two longitudinal brown bands, their width apart, a white pigment spot at the base of each coxa. Legs with brown bands slightly wider than intermediate area. Abdomen in alcohol, dorsum whitish with two parallel longitudinal dark bands, their outlines black (Fig. 128). Venter sometimes with dark pigment, generally light with two parallel white lines enclosing but touching a pair of white spots in the middle. Anterior median eyes one diameter apart, three-quarters diameter from laterals. Posterior median eyes one and one-half diameters apart, two diameters from laterals. The abdomen of the male is shield-shaped, pointed behind; there are no tubercles (Fig. 128). Total length 4.0 mm. Carapace 2.4 mm long, 2.0 mm wide. First femur, 2.7 mm; patella and tibia, 3.0 mm; metatarsus, 2.7 mm; tarsus, 1.2 mm. Second patella and tibia, 2.5 mm; third, 1.5 mm; fourth, 2.1 mm.

Female from the West Indies. Carapace covered completely with white scales that are silver in living specimens. Sternum brown with a median white line. Legs with dark bands. Abdomen in alcohol, anterior white, posterior with a dark pattern containing white spots (Fig. 126). In living specimens, mostly silver. Venter with a transverse white bar which has a width almost one-third length of distance between spinnerets and epigynum; otherwise black, except lateral tubercles whose venter is white. Anterior median eyes one and one-half diameters apart, posterior median eyes

→

Argiope blanda O. P.-Cambridge. Figs. 137–147. Female. 137. Carapace. 138. Eyes and chelicerae. 139. First left coxa and trochanter. 140–143. Epigynum. 140. Lateral view. 141. Dorsal view. 142. Posterior view. 143. Ventral view. 144–147. Abdomen. 144. Venter. 145. Dorsum, pattern. 146. Lateral view. 147. Dorsum. Figs. 148–153. Male. 148. Carapace and abdomen. 149–151. Left palpus. 149. Mesal view. 150. Ventral view. 151. Ectal view. 152–153. Right tip of embolus.

Argiope savignyi new species. Figs. 154–161. Female. 154. Carapace. 155. Eyes and chelicerae. 156–159. Epigynum. 156. Dorsal view. 157. Lateral view. 158. Ventral view. 159. Posterior view. 160. Abdomen venter. 161. Abdomen dorsum. Figs. 162–169. Male. 162. Eyes, chelicerae and palpus. 163. Carapace and chelicera. 164. Carapace. 165–167. Palpus. 165. Mesal view. 166. Ventral view. 167. Ectal view. 168–169. Tip of embolus.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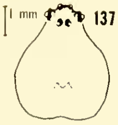
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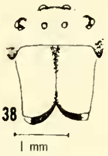
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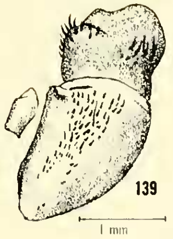
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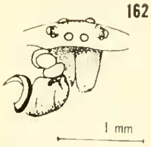
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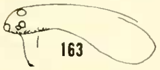
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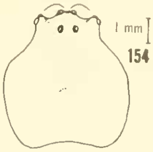
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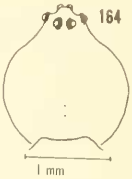
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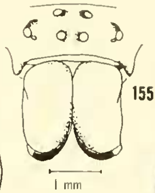
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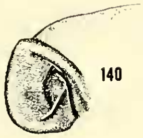
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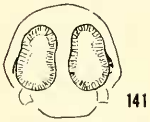
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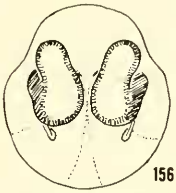
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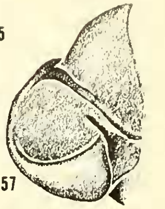
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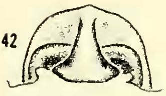
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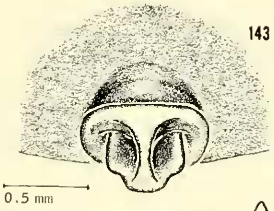
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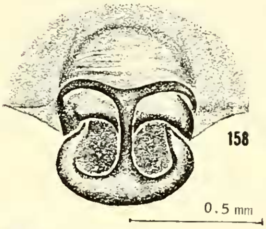
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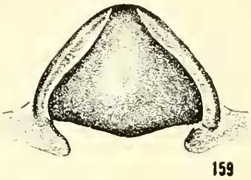
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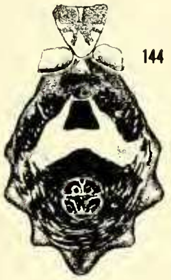
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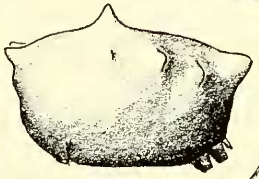
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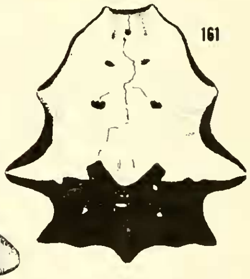
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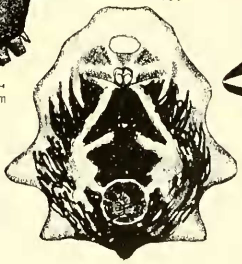
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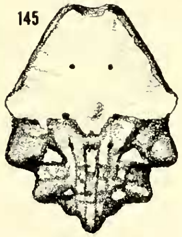
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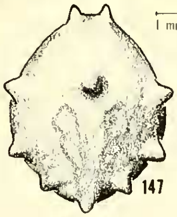
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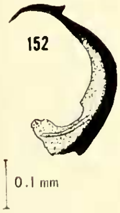
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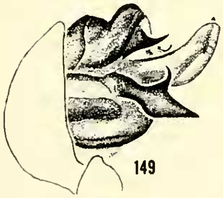
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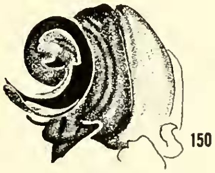
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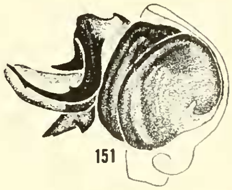
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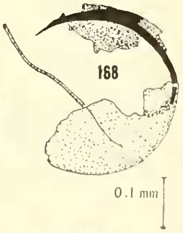
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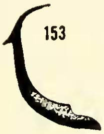
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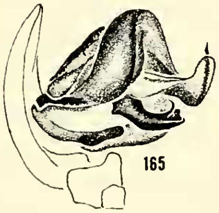
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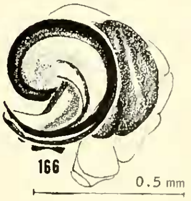
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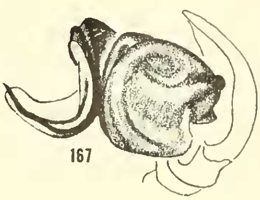
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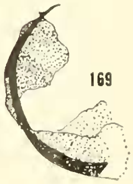
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less than two diameters apart. Lateral eyes on higher humps than other species. Abdomen with tubercles around posterior margin (Figs. 125, 126). Total length 12 mm. Carapace 5.7 mm long, 4.6 mm wide. First femur, 6.5 mm; patella and tibia, 9.1 mm; metatarsus, 8.9 mm; tarsus, 1.7 mm. Second patella and tibia, 7.5 mm; third, 5.2 mm; fourth, 7.5 mm.

Variation. There is relatively little variation in size among females of this species.

Diagnosis. The small projection or curl near the tip of the embolus (Figs. 130–133, 135–136) is diagnostic for this species and is not found in any other *Argiope* known to me. Females may be difficult to separate from *A. blanda*. However, Mexican and Central American specimens of *A. argentata* have the posterior face of the epigynum with a depression on each side (Fig. 122), while the posterior face of the epigynum of *A. blanda* is narrower and lacks the depressions. The frequent presence of the broken off, easily identified male embolus tip in the female epigynum facilitates the identification of females.

Habits. Adult males have been collected in February and March and also in June in Florida. The only months for which there are no records of adult females are September and October, but this may reflect the lack of collecting at this season in Florida. It is possible that unlike the temperate species which have only one generation a year, *A. argentata* may have several.

Argiope argentata is found around houses and in gardens, in great abundance at the southern tip of Florida. Its distribution appears to be limited by low temperatures rather than by unsuitable habitat. In the desert of eastern Peru it is found in shrubs along irrigation ditches of stream valleys; in the dry areas of western Argentina it occurs in more moist habitats that provide suitable shrubs for large orb webs.

The web of the adult *A. argentata* has four zigzag stabilimenta forming a cross, the bands going to each corner. None of the webs of the adult *A. argentata* that I have seen in southern South America had a complete stabilimentum; most lacked them completely. Juveniles have zigzag bands that are quite irregular (Plate I).

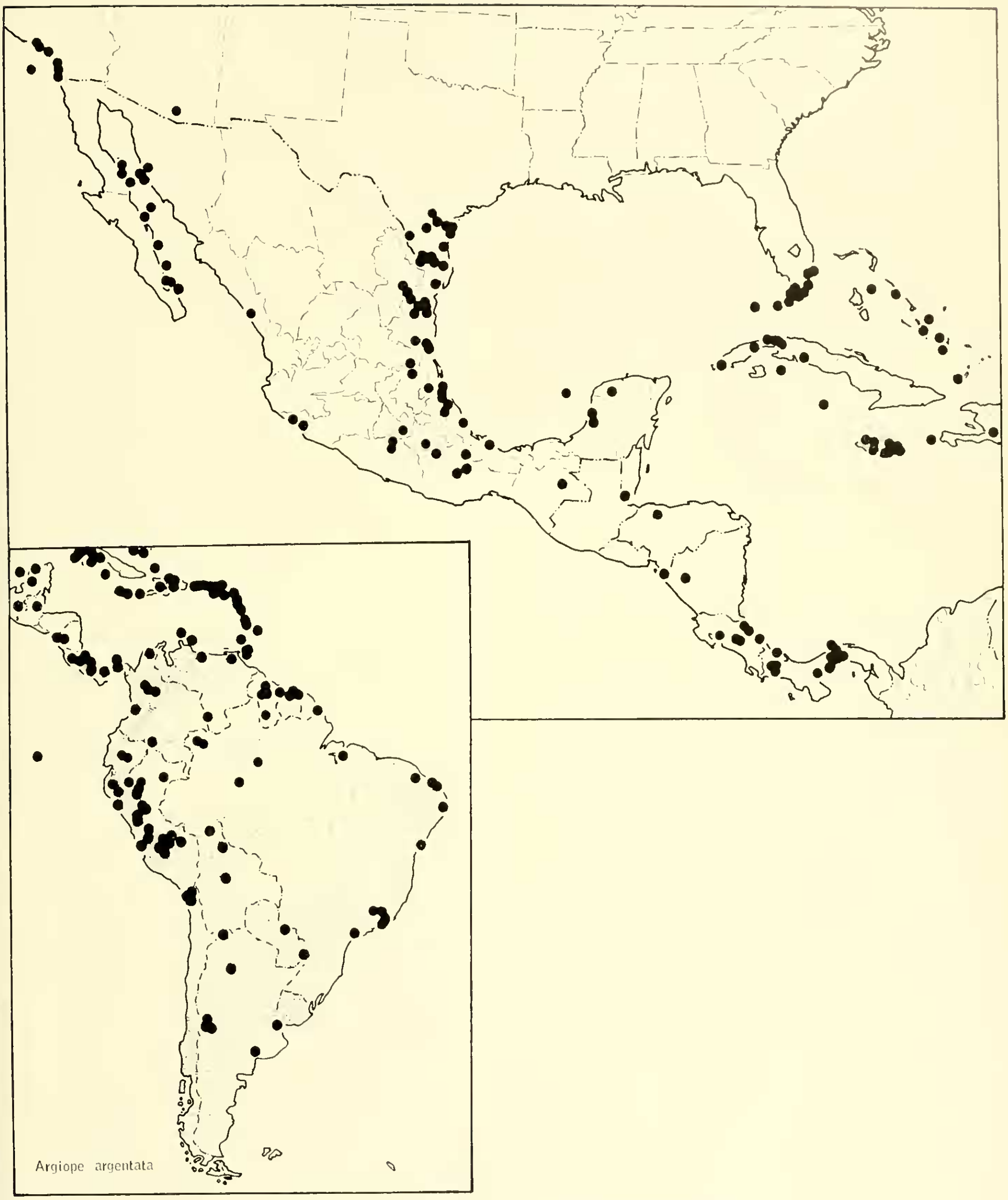
Distribution. Southern Arizona, probably southern California, southern Texas, southern Florida to Central Argentina, Provinces Mendoza and Buenos Aires. It is absent from Chile, except for the northernmost tip of the country (Map 5).

Argiope blanda O. P.-Cambridge
Mexican Argiope
Figures 137–153; Map 6

Argiope blanda O.P.-Cambridge, 1898, Biologia Centrali-Americana, Araneidea, 1: 267, pl. 37, fig. 2, ♂. Male holotype from Santa Ana [20 km SW of Cobán] Guatemala, in the British Museum, not examined. F.P.-Cambridge, 1903, *ibid.*, 2, 451, pl. 43, fig. 1, ♂.

Description. Male. Carapace yellow-brown, some black pigment on each side. Sternum yellow-brown, black on each side, and a white pigment spot between last coxae. Legs with scattered black pigment. Dorsum of abdomen with white pigment and indistinct median darker foliate pattern (Fig. 148). Venter black with two longitudinal lines not very distinct, closer together, anteriorly. Anterior median eyes one diameter apart, about one radius from laterals. Posterior eyes about two diameters apart. Total length 3.4 mm. Carapace 1.7 mm long, 1.4 mm wide. First femur, 1.6 mm; patella and tibia, 2.1 mm; metatarsus, 1.7 mm; tarsus, 0.8 mm. Second patella and tibia, 1.5 mm; third, 1.0 mm; fourth, 1.6 mm.

Female. Carapace yellow-brown covered by white scales. Sternum black with a white spot between the 4th coxae (Fig. 144), legs indistinctly banded. Anterior half of dorsum of abdomen white, posterior mostly dark (Fig. 145). Venter black with a wide transverse white band. From the lateral ends of the white band, two median lines pass anteriorly towards the epigynum. Anterior median eyes one diameter apart, one and one-half diameters from laterals. Posterior median eyes almost two diam-



Map 5. Distribution of *Argiope argentata* (Fabricius).

eters apart, three diameters from laterals. The abdomen has posterior lateral tubercles and also a very distinct median dorsal tubercle (Figs. 145–147). Range of size of female 9–14 mm. Measurements of one specimen, total length 10 mm. Carapace 4.2 mm long, 3.2 mm wide. First femur, 5.9 mm; patella and tibia, 6.4 mm; metatarsus, 6.0 mm; tarsus, 1.8 mm. Second patella and tibia, 6.3 mm; third, 3.6 mm; fourth, 5.5 mm.

Diagnosis. The large thorn at the base of the embolus of the palpus is diagnostic (Figs. 149–151) and not found in other species. The epigynum of the female is very much like that of *A. argentata* but the posterior face of the epigynum (Fig. 142) is narrower, domed, and lacks depressions. To separate females, broken-off embolus tips usually found in the epigynum are useful.

Distribution. From southern Texas to Costa Rica (Map 6).

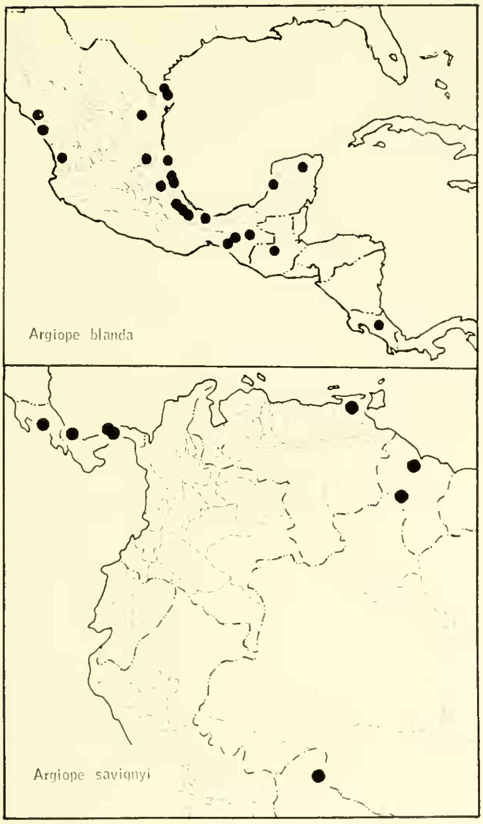
Argiope savignyi new species
Savigny's Argiope
Figures 154–169; Map 6

Holotype. Male from Barro Colorado Island, Panama Canal Zone, 14–18 Jan. 1958, collected by A. M. Chickering, in the Museum of Comparative Zoology.

Description. Male. Area between eyes light. Eyes on black spots. Carapace otherwise dark bluish brown to black with a median light band which widens in the middle to wider than eye area and narrows anteriorly toward the posterior median eyes. Sternum light with a posterior narrow longitudinal white stripe and a black mark on each side anteriorly. Coxae and other leg segments dark bluish brown to black with proximal third of third femora and second tibiae and also metatarsi and tarsi light. Palpi light except cymbium, which is brown. Dorsum of abdomen with heavy white pigment. Venter of abdomen black with a bracket-shaped white mark on each side and a small white spot on each side of spinnerets. Anterior eye row straight as seen from front, posterior eye row procurved as seen from above. Ocular quadrangle longer than wide, wider behind. Anterior lateral eyes half the diameter of anterior medians, posterior median eyes twice the diameter of anterior medians, posterior lateral eyes 0.8 diameter of anterior medians. Anterior median eyes a little more than their diameter apart, same distance from laterals. Posterior median eyes one and one-half diameters apart, one and one-quarter diameters from laterals. Total length 3.4 mm. Carapace 2.1 mm long, 1.6 mm wide. First femur, 2.4 mm; patella and tibia, 2.4 mm; metatarsus, 2.1 mm; tarsus, 1.2 mm. Second patella and tibia, 2.3 mm; third, 1.2 mm; fourth, 1.9 mm.

Female. Carapace brown, but covered with white, silky hairs. Sternum black with a wide, white median longitudinal band having some radiating white lines. Legs black. Dorsum of abdomen with heavy white pigment anteriorly and very few silvery hairs, posterior black (Fig. 161); venter black except for white marks shown in Figure 160. There is no continuous transverse white band on venter. Posterior eye row procurved, ocular quadrangle longer than wide, wider behind. Anterior lateral eyes smaller than others, the others about equal in size, lateral eyes on tubercles. Anterior median eyes one diameter apart, posterior median eyes one and one-half diameters apart. The abdomen is similar in shape to that of *Argiope argentata*, but the lateral tubercles seem more pointed. Total length 14 mm. Carapace 4.6 mm long, 4.2 mm wide. Measurements of first leg (which is broken off and might possibly be the second leg): femur, 8.4 mm; patella and tibia, 9.0 mm; metatarsus, 9.1 mm; tarsus, 2.1 mm. Third patella and tibia, 4.9 mm.

Diagnosis. The different color (Fig. 161), black where *Argiope argentata* is brown, the white dorsum of the abdomen with sparse, silvery hair and heavy pigment, and also the posterior swollen transverse section of the epigynum (Figs. 158, 159) separate the females readily from those of *A. argen-*



Map 6. Distribution of *Argiope blanda* O. P.-Cambridge and *A. savignyi* new species.

tata. The epigynum, like that of no related species, is filled with exudate after mating that clings to the broken-off embolus tip (Figs. 168, 169). The male differs from *A. argentata* also by the more contrasting colors and by lacking the fork at the tip of the embolus of the palpus (Figs. 166–169)[1].

Distribution. Costa Rica, British Guiana, to northern Bolivia (Map 6).

Records. Costa Rica, Puerto Viejo, Sarapiquí, 20 Jan. 1959, (S. M. Le Roi Léopold III, Brussels Museum). *Panama.* Bocas del Toro; Boquete 4–11 Aug. 1950, ♀ paratype (A. M. Chickering, Mus. Comp. Zool.); Gamboa, Aug.–Sept. 1954, ♀ paratype, (W. Lundy, Amer. Mus.); 4.8 km SW of Arraijan, Sept. 1945 (C. D. Michener, Amer. Mus.). *Panama Canal Zone,* Barro Colorado Isl. Old Plantation, 14 July 1954, ♀ paratype (A. M. Chickering, Mus. Comp. Zool.), Barro Colorado Island, July 1954, paratypes (Paris Museum), (A. M. Chickering), (N. Banks, Mus. Comp. Zool.), (H. F. Schwarz, Amer. Mus.), Gamboa, Aug.–Sept. 1954, ♀ paratype, (W. Lundy, Amer. Mus.), France Field, ♂ paratypes (A. M. Chickering). *Venezuela:* Caripito (W. Beebe, Amer. Mus.). *British Guiana.* Kartabo (Amer. Mus.); Kamakusa, Feb. 1923 (Lang, La Varce, Amer. Mus.). *Bolivia.* Cashuela Esperanza, Prov. Vaca Diez, ♀, 10–11 April 1922 (J. H. Williamson, Mus. Comp. Zool.).

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(Received 17 March 1967.)

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[1] The stabilimentum of the *A. savignyi* web is in form of a cross. But as in *A. argentata* from Barro Colorado Island, it is rarely complete, sometimes a diagonal line, or just one or two bottom branches. The silk deposited on the stabilimenta may be more dense than that of *A. argentata* (M. H. Robinson, in letter, 1968).

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